The Dock and Harbour Authority

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CONTENTS

EDITORIAL	173	TEMPORARY DAMS	188
THE DEVELOPMENT OF LONDON RIVER	175	NOTABLE PORT PERSONALITIES	191
THE PROBLEM OF POST-WAR SHIPPING	179	HARTLEY MEASURED MILE POSTS	192
PORT ADMINISTRATION AND FINANCE	180	THE BRITISH ENGINEERS' ASSOCIATION	193
CORRESPONDENCE	182	LEGAL NOTES	194
THE WAR DAMAGE ACT, 1941	183	INSTITUTION OF MECHANICAL ENGINEERS	194
NOTES OF THE MONTH	184	PROTECTION PROBLEMS	195
SEA-GOING HYDRAULIC HOPPER DREDGERS	185	THE WIDTH OF TRANSIT SHEDS	196

Editorial Comments

The London River.

Although more exactly described by its geographical designation of the Thames Estuary, that part of the River Thames which lies between London and the sea, is commonly referred to among seafaring men as the London River. The title is apt and fitting, since the whole of its functions in historical times has been devoted to the exploitation and development of the fortunes of the mighty metropolis on its banks. Indeed, it is the Port of London which confers on the stream all the international dignity and commercial importance which it enjoys. Through the centuries, ships have sailed in and out of the estuary, making their way to the Port of London, all participating in and contributing to the world-wide commerce of the English capital.

The location of London at a distance of some fifty miles from the sea is undoubtedly advantageous, from a trading point of view, for linking up the internal producing and consuming centres of the country with the corresponding marts of the outer world. But the physical condition of the approaches to the port from seaward has not by any means proved equally favourable, especially in modern times, since the tremendous development in size of ocean-going vessels made exacting demands on the capacity of navigable channels in coastal waters. It has, in fact, been a continuously insistent problem how to adapt the port approaches to the standards of modern ship construction.

The leading article in this issue gives a brief review of the obstacles and vicissitudes which have been encountered in facing the problem of channel improvement and the measures taken to deal with them. Londoners, it is to be feared, have not always, nor very readily, appreciated the difficulties confronting those responsible for the welfare of the port and its trade. It should be realised, however, that a constant and unremitting struggle has been necessary to maintain the prestige of the chief port of the country.

Unlike certain other leading ports, such as Liverpool and Bordeaux, London is not hampered in its approach channel by the existence of a bar. On the other hand, the mouth of the estuary is beset with numerous shoals with intermediate swatchways and channels, which have an undesirable tendency to shift their positions and vary their depths. Now that a serviceable deep-water passage, the Yantlet Channel (described by Captain Shankland, the River Superintendent of the Port of London Authority, in our issues of April and May, 1941), has been achieved through the threshold of the river proper, it seems probable in the early future, when conditions have resumed normality, that the energies of the Port Authority will be directed towards dealing with these outlying approaches, in order to ensure adequate and convenient access to the port.

The Thames Embankments.

An interesting and notable feature of the Lower Estuary of the Thames, briefly alluded to in Mr. Bowen's article, is the dual line of irregular, though roughly parallel, embankments, which flank the river on both sides, co-extensive with vast stretches of low-lying marshland, aggregating over 60 square miles in extent. The object of these embankments is twofold. In the first place, they serve to confine the main stream within definite limits and to concentrate the tidal flow to the best advantage; and, in the second place, they are a protective bulwark for the marshland in the rear, defending it from periodical flooding at times of high water, especially during spring tides. Though mostly utilised for the grazing of cattle, a considerable portion of the area is cultivated, while along the river frontage a number of factories and industrial works have established themselves under the protection afforded by the embankments. On the construction and maintenance of these modest, but essential, works, enormous sums of money have been expended throughout past centuries of English history. One important feature is the means taken, in the form of sluices and culverts, to dispose of the discharge from numerous inland water-courses which lie within the jurisdiction of the riparian catchment boards.

The question of liability to tidal flooding is of vital importance to the whole district of the London River, and it has been the subject of several reports. Following a disastrous inundation in January, 1928, when the protective works were breached in a number of places, resulting in loss of life as well as damage to property, there was a report in July of that year by a committee appointed at a conference of public authorities. Then, in 1933, was issued a report by a Departmental Committee of the Ministry of Health. This latter committee made a series of recommendations, the principal of which was that the activities of the numerous local authorities for the prevention of flooding in the tidal basin of the Thames should be co-ordinated and a survey made of the

Editorial Comments—continued

whole area to see what works of flood defence were required. The recommendations, however, did not commend themselves to the authorities concerned and were not implemented. At the same time, it is to be recorded that a great deal of defensive work has been carried out, chiefly by the London County Council and that research into tidal conditions was in hand up to the commencement of the present war. No doubt it will be resumed in due course.

New Bill of Lading Clause.

Circumstances arising out of the necessity for avoiding cargo congestion at New Zealand ports have given rise to the insertion of an additional clause in outward bills of lading from this country, affecting liners trading to New Zealand. Special committees appointed by the Dominion Government have been given power to authorise the removal of incoming goods from the precincts of a port of discharge to sites where more space is available for sorting and temporary storage. Such removals, it is explained, clearly may represent an interruption of the direct transport of merchandise from consignor to consignee. The new clause briefly states that the bill of lading is subject to the provisions of Clauses 14 and 15 of the Cargo Control Emergency Regulations, 1942, New Zealand. These regulations provide that where any goods are removed by, or by the direction of, the control committee from the custody or control of any harbour board, wharf owner, or warehouse owner at any time when they are subject to a lien for freight or other charges payable to the ship owner, they shall continue to be liable to the same lien in the hands of any persons to whom they are delivered by direction of the committee.

The regulations then state that, by reason of their operation, shipowners shall not be responsible for maintaining the goods in a safe condition after they have been discharged from the ship or, where a harbour authority is the bailee, as agent of the shipowner, after they have been removed from the custody of the harbour board. Freight charges are now generally payable in advance, so presumably any lien there might be on the goods for charges would be in respect of port and similar dues. In such circumstances of superior control of the cargo, the desire of shipowners and port authorities to exonerate themselves from liability for the safe custody of the goods, is natural and can be readily understood. Insurance policies will necessarily be affected and special arrangements will have to be made to cover the new conditions of lien.

Dock Labour Contributions from Coastwise Shipping.

At the annual meeting of the British Motor and Sailing Ship Owners' Association, held in London at the end of October (at a time when our preceding issue was at press), the chairman, Mr. W. J. Everard called attention to what he considered an inequitable incidence on the coasting trade of the contributions levied in connection with the National Dock Labour Corporation Scheme. It will be recollected that at ports where an approved dock labour scheme is in force, operating employers have to make a contribution of 25 per cent. of their wages bill to the Dock Labour Fund, which is designed to secure a regular livelihood for dock workers in place of the casual receipts on which they previously existed.

The argument on which Mr. Everard's complaint was based was that, whereas goods conveyed in an overseas vessel only incurred port dues or tolls, at one port in this country, cargoes conveyed by coasters were charged both at the loading and at the discharging port. Further, a coasting vessel made many more voyages per annum than a deep-sea ship, so that the annual proportion of such charges to its tonnage was correspondingly greater. For these reasons, he felt that there should be a differentiation in the labour charge percentage, such as was made by dock and harbour authorities in regard to port dues. He anticipated an extension after the war of the principle of decasualisation and urged that coasting ship owners should realise its implications.

At first sight, Mr. Everard's contention seems reasonable enough, but it is desirable to point out that there is a basic difference between port dues and cargo handling charges. The former are levied in return for shelter and accommodation for shipping, and go to reimburse the port authority for the outlay which they have incurred in providing such facilities. They are quite distinct from labour charges, which are payments for services actually rendered to the parties directly concerned. Apparently the objection is chiefly that, although coasting tramp rates are generally quoted "F.I.O." (that is, cargo loaded and discharged by shipper), the extra charges would have to be incurred by the charterer and might make all the difference in deciding whether the goods were to be sent by sea or otherwise.

"Transport Goes to War."

The issue of an official booklet on the subject of the war activities of internal transport in this country is timely and serviceable. The publication is commendable in many respects, and constitutes a valuable record of the achievements of the national effort in branches of service behind the battle-front. It gives a very clear and vivid picture of the various forms of transport, showing how they are organised and inter-connected so as to produce effective results. At the same time, we feel that it gives the impression of being just a little too partial to rail and road services to the implied depreciation of those performed by ports, coastal shipping and canals. Two of these branches are dealt with rather summarily, while coasting shipping is unaccountably entirely ignored.

Attention has been called to this omission in the press and elsewhere, and adverse comment has been so emphatic, that Lord Leathers, the Minister of War Transport, has felt compelled to make a public explanation in the course of an address which he delivered at the Institute of Transport on November 3rd. The matter is of such importance that, in justice to a great industry, we feel it desirable to reproduce the whole of his statement as follows:—

"I should like to say a special word to-day about the smaller ships plying round our coasts. Last week there was published on my behalf a booklet called 'Transport Goes to War.' I know that many of my friends felt a slight sense of grievance that in a pamphlet rightly drawing attention to the great work done by men engaged in inland transport nothing has been said about coastal shipping, which is, by its function, part of the inland transport system. I would ask them to be patient. The story of the coasting ships will be told at the right time. The booklet we published last week had, for reasons of space, to be confined to the land side of our transport system. But because some of you in the coasting trade may have felt neglected I want to-day to say a word about the coasting ships.

"Perhaps the most outstanding fact about our coastwise shipping is that after three years of war, despite attacks from the air, by surface craft, by submarine and by mines, we have a greater volume of shipping employed on our coasts to-day than we had in time of peace. I do not need to tell how the coasters help to relieve the strain on the inland transport system, how they move cargoes and particularly bulk cargoes, round our shores. But there is one particular aspect of their work in war which I should like to mention, namely, the way in which they can be used to speed up the turn-round of the deep-sea ships. Wherever we can, we discharge the ocean-going ship overside direct into coasters concurrently with discharge on to the quays, thus by one and the same operation saving time on the discharge and taking part of the strain of distribution off the railways. . . . These ships make altogether some 25,000 voyages a year round our coasts, and this has involved already more than 1,000 coastal convoys and practically non-stop work by all concerned."

Port Accountancy.

The article on the Depreciation and Maintenance of Cargo Handling Plant at Ports, which we published in a previous issue, renders it appropriate to reproduce in this issue the Report of the American Committee on Port Administration and Finance, containing a description of the Accountancy System in vogue at the Port of San Francisco.

The Report points out that methods of port accountancy are extremely diversified, making it difficult to arrive at comparable results of port operation. Whether, in view of the wide latitude in conditions obtaining in different countries and different localities, it would be practicable to arrive at a common system of accountancy, is a matter on which there will be much doubtful disputation amongst those best qualified to judge. At any rate, it is of interest and value to have the detailed statement of the methods adopted at a port of the rank of San Francisco, even if they may not be applicable to any great extent elsewhere.

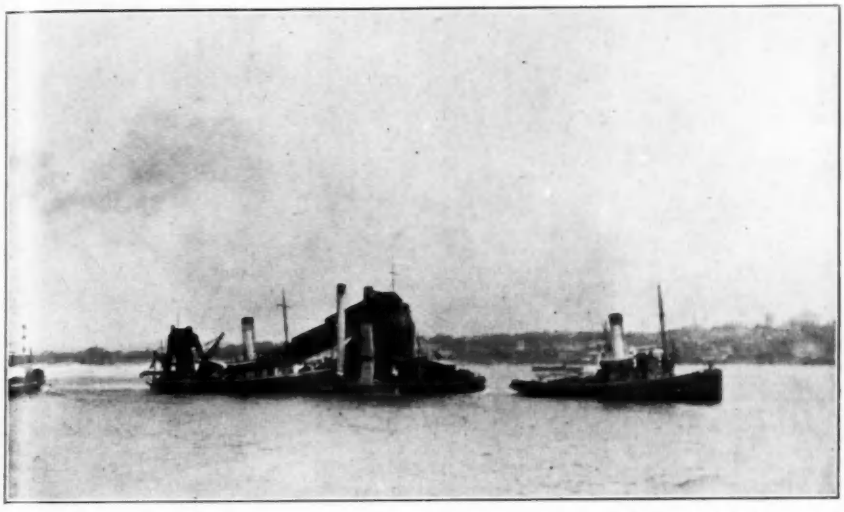
The Development of London River

By FRANK C. BOWEN.

Early History

THERE is nobody in the world in any way connected with shipping who does not know of the wonderful manner in which the Tyne and Clyde have been converted by man's efforts from little streams to mighty commercial waterways, but the work that has been done developing the London River passes almost unnoticed and it is the development of the docks which gets very much more attention. Yet the improvement in the river has been just as remarkable and its history is even more interesting. The river has been used for shipping since Roman days at least, but although there were many shallows in it then, and many places well downstream where it was easily fordable at low water, the requirements of light draught ships of early days, with little concern for time, were satisfied.

The Corporation of the City of London was granted the conservancy rights of the river in return for their help in financing



[Nautical Photo Agency.

The Port of London Authority's tugs "Darent" and "Westbourne" moving the dredger "India" in the river.

Richard I's Crusade, but its activities appear to have been limited to the removal of the kiddle nets and similar obstructions to navigation and dredging was not considered, although it was undoubtedly practised by the ancient Phœnicians and certainly by Nearchus, Alexander the Great's admiral, after whom several modern dredgers have been named. By the Sixteenth Century ships had become sufficiently large, and were drawing enough water, for the river to be a matter of concern, but the economical Tudors, while they were anxious to help shipping, always sought an opportunity to do it without expense to themselves and ingeniously combined dredging with the valuable right of supplying ballast to outgoing ships. In 1536, any shipmaster was allowed to dig his ballast from the river, "in the hope that they would first attack the shoals as being easier," and later the right to raise ballast was made a perquisite of the Lord High Admiral, its value being increased by forbidding ships to take ballast from the land. This prohibition Charles I repeated in 1635. The unfortunate factor which spoiled the system was that those who were financially interested naturally dredged where the ballast was cleanest and best, not where the fairway required most attention.

Responsibilities of Trinity House

Both Henry VIII and Elizabeth had steadily increased the duties and responsibilities of Trinity House without providing it with an income to carry them out. It was Lord Howard of Effingham, Lord High Admiral, who rectified matters by surrendering his ballast right to Queen Elizabeth on the understanding that she would grant them to Trinity House in order to give them the necessary funds. It was a natural temptation for the Corporation to use them for that purpose rather than for improving the fairway, an attitude which the House adopted quite honestly, but it always had to face criticism and it has been suggested that their dredging responsibilities may have influenced the Elder Brethren in their policy of constantly opposing unusually big ships on the grounds of safety. In 1685, there was quite a panic among London shipowners at the news that the river had shoaled an average of 4-ft. in four years, a report which it is difficult to take seriously, although it is quite possible that certain shoals, especially those caused by wrecks or artificial obstructions, may well have increased by that amount.

Early Dredging Appliances

The earliest dredgers used on the river were similar to those used in ancient China and were of the bag-and-spoon type which were not operated by capstans for many years afterwards. In 1618 John Gilbert, of London, was granted a patent for a "water plough," which merely stirred up the mud at the bottom and let the tide carry it to the next convenient dropping place. It would be interesting to have details of the dredger of unknown type which was patented in 1667, and which is reported to have raised two tons of spoil from 19-ft. of water on Barking Shelf in 1½ minutes. A power dredger was invented by a Dutchman named Meyer in 1685, worked by horses and used for constructing dykes in Holland, but this does not appear to have been used in England. The first bucket dredger was patented by Savery in 1718, and one was built in England in 1747. James Watt obtained a patent in 1796 and Boulton and Watt built one in the following year

By that time there was need of the services of efficient dredgers on the Thames. There was a considerable increase in the size of warships using Deptford and Woolwich Dockyards in the middle of the Eighteenth Century, and in the latter part of it the East Indiamen which used Blackwall were forced into a rapid increase in size, so that they had to break and complete the loading of cargoes with the help of lighters in Long Reach.

The construction of the early docks at the beginning of the Nineteenth Century created an insistent demand for a better fairway up to them; in 1800 the West India Dock Bill was opposed by pilots and other river men who maintained that it was unsafe for ships drawing 16-ft. of water to venture so high upstream and gave evidence that no pilot would risk it on the neap tides and that it would be imprudent even on springs. The bill was passed in spite of that, and Trinity House and the Corporation of London continued to argue over the poor definition of their responsibilities for dredging below London Bridge. The Corporation maintained that the House should be responsible owing to the profits that it made out of ballast rights, but the House maintained that the rights were granted them as a source of income only. The Admiralty was interested on account of the Royal Dockyards and attempted to fix the responsibility on the City, but was unsuccessful. Trinity House built its first "powerful steam dredger" in 1810, a combination of the patents of Rennie and Boulton & Watt, and in 1833, had two 20 h.p. steam bucket dredgers at work, the *Hercules* of 270 tons burthen, and the *Sampson* of 200 tons.

Difficulties of Trinity House

Criticism of Trinity House increased, although they maintained their attitude that the fairway was no concern of theirs and pointed out that the fabulous stories of their income from the ballast rights were ill-founded. In the 'twenties, they made an average of about £2,000 per annum out of the business, but in 1831 they spent

The Development of London River—continued

nearly £24,000, mostly on improved dredgers, and only sold £6,500 worth. The City Corporation still had the right to grant certain ballast licences.

In 1834 a great dispute started between the Admiralty and Trinity House, the Navy's efforts to saddle the Corporation of London with the responsibility having proved unavailing. My Lords turned on the House and maintained that they were responsible for the dredging of all shoals whether they consisted of saleable ballast or not, and some of the worst did not. Matters came to a head two years later, when a Parliamentary Commission was set up and stressed the need for removing shoals and obstructions, suggesting that all the conflicting interests should be consolidated into one body to carry out the work. The river was at the Conservancy's expense and it retained some of its ballast rights, although the Conservancy could prevent any work which might be injurious to the fairway. In the 'sixties the Conservancy took over the last dredging and ballast work and soon did well out of the latter, far better than the House had contrived to do. In this it was helped partly by the increase in the size of sailing ships and in their number, but more by the revolutionary improvements in dredging material which were permitted by the adoption of the surface condensing engine. They certainly needed better material, for the river was in a shocking condition when they took over.

The Pool was in a better shape than it had been in the 'thirties, but Limehouse Reach was spoiled by the Whiting Shoal, which

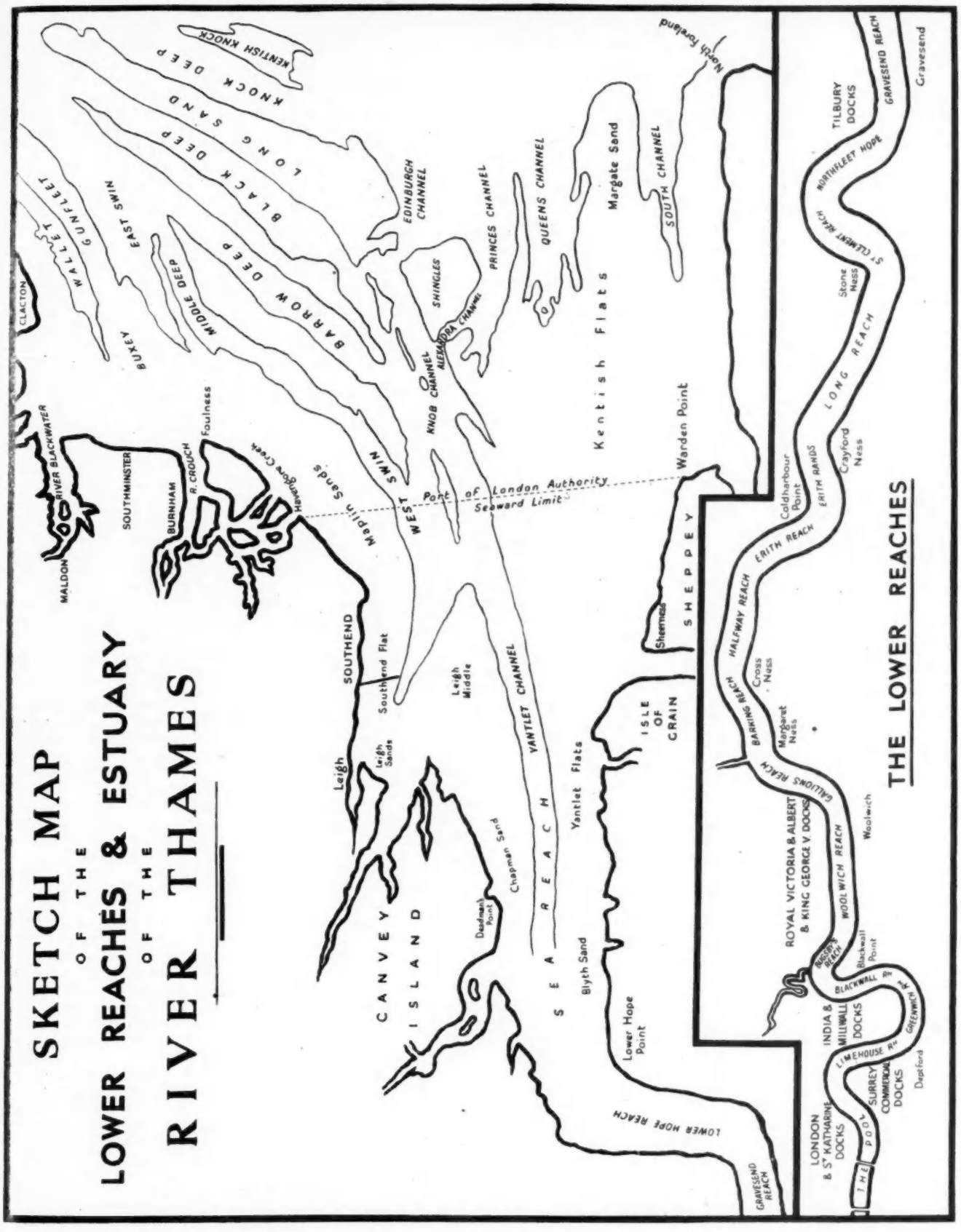
View of Thames at Woolwich Ferry.

getting worse; in the Pool many shoals had been caused by the rubbish from the demolition of old London Bridge being dumped into the stream. At this commission it was obvious that there was a strong feeling that Trinity House should be replaced as the dredging authority, but nothing was done for another twenty years.

It had been pointed out that Trinity House, as the controlling authority, had been employing convict labour for raising ballast as well as for clearing shoals. The hulks at Woolwich and Deptford had been introduced in 1776, when the Independence of the United States prevented the transportation of felons to the plantations in lieu of hanging and, pending the arrangements which were later made to transport them to Australia, the hulks were established where the convicts could be kept to do useful public work, especially the dredging of the approaches to Deptford and Woolwich Dockyards. They were kept in wretched conditions, half-starved and often brutally treated, yet in the early days, at least, their sentence to the hulks or to transportation was regarded as next door to a verdict of "Not Guilty." The public was beginning to revolt against indiscriminate hanging and a start was made with an alternative sentence for men who would often get off with a fine nowadays. The employment of convicts for dredging work on the London River was abolished in 1856.

Institution of Thames Conservancy

In the following year the Thames Conservancy was founded and authorised to dredge the river in the interests of navigation, but Trinity House was still responsible for carrying out the work was being reduced by explosives, and a bank of mud which extended one-third of the way across the river from Cuckold's Point. In Greenwich Reach, there was a shoal on the Kentish side, which nearly dried at low water from just below Deptford Creek to West Greenwich. Blackwall Shelf off Saunder's Ness was a serious obstruction, while there was another shelf, extending one-third of the way across Bugsby's Reach with only 5 or 6-ft. of water over it. In Woolwich Reach the Charlton Shoal, less than 9-ft. at low water, stretched nearly half-way across the river and in mid-stream there was the particularly troublesome Horse Shoal with only 7-ft. Gallions Reach had many shallows, especially a 7-ft. shoal which extended nearly a quarter of the width of the river from the Warren to the Point. Barking Shelf had been a great obstruction, but shortly before the Thames Conservancy took over it had been discovered that it consisted of very good ballast and it had already been greatly reduced although there was still less than 10-ft. of water over it. Erith Reach was spoiled by two big shoals which had no more than 4-ft. in places. One extended one-third of the way across the river from Jenningtree Point and the other occupied half the stream for half-a-mile along the shore from Coldharbour Point. Combined, they made the navigation of the Reach very tricky for sailing vessels. In Erith Rands the worst obstruction was the Rands Hall Shoal in mid-stream at the upper end, about 7 or 8-ft., but there were no longer the islands at low water which had been there in historic times. St. Clements Reach was obstructed by a shoal ridge from Stone Ness, and a shelf on the South-east side extending from half-way

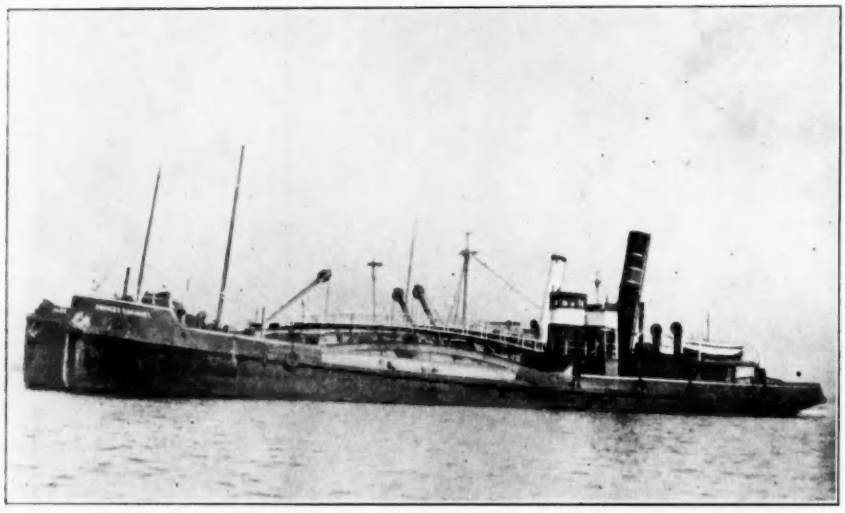

SKETCH MAP
OF THE
LOWER REACHES & ESTUARY
OF THE
RIVER THAMES
THE LOWER REACHES
MALDON
RIVER BLACKWATER
SOUTHMINSTER
BURNHAM
R. CROUCH
Foulness
Gubbone Creek
Havengore
CLACTON
MALLETTS
GUNFLEET
BUXEY
EAST SWIN
MIDDLE DEEP
BARROW DEEP
BLACK DEEP
LONG SAND
KNOCK DEEP
KNOCK
KENTISH KNOCK
EDINBURGH CHANNEL
SHINGLES
PRINCES CHANNEL
QUEENS CHANNEL
SOUTH CHANNEL
Margate Sand
North Foreland
Kentish Flats
Warden Point
KNOB CHANNEL
ALEXANDRA CHANNEL
WEST SWIN
Maplin Sands
Port of London Authority
Seaward Limit
SOUTHEND
Southend Flat
Leigh
Leigh Sands
Leigh Middle
CANVEY ISLAND
Dadman's Point
Chapman Sand
YANTLET CHANNEL
SEA REACH
Yantlet Flats
Blyth Sand
Lower Hope Point
LOWER HOPE REACH
GRAVESEND REACH
ISLE OF GRAIN
SHEPPEY
Sheerness
Coldharbour Point
ERITH SANDS
Crayford Ness
LONG REACH
BARKING REACH
HALFWAY REACH
ERITH REACH
Cross Ness
Margaret Ness
GALLIONS REACH
ROYAL VICTORIA & ALBERT & KING GEORGE V DOCKS
WOOLWICH REACH
Woolwich
RIESS'S REACH
Blackwall Point
BLACKWALL Pt
INDIA & MILLWALL DOCKS
LIMEHOUSE Pt
GREENWICH Pt
Deptford
SURREY COMMERCIAL DOCKS
LONDON & St KATHARINE DOCKS
THE POOL
NORTHFLEET HOPE
St CLEMENT REACH
Stone Ness
TILBURY DOCKS
GRAVESEND REACH
Gravesend

The Development of London River—continued

down the reach to Broad Ness. In addition, the Black Shelf, which had been great increased by a breach of the river bank in 1690, was very dangerous to sailing ships which often missed stays in trying to get a long reach up the river and were driven on to it by the inset of the current. In the Lower Hope the Oven Shelf was extended by the Oven Shoal, and Sea Reach had many shoals, but they were well marked and there was ample water between them. At one time the Yantlet Middle formed a serious obstruction but it was washed away by tidal action, for in those days the banks were very much more mobile than they became after the inauguration of the London Sewage Scheme.

Opening of Tilbury Dock System

Thames Conservancy dredging, being directed principally to the improvement of the fairway, was an improvement on that of Trinity House and the worst shoals in the river were soon removed, but the shipowners, with the size of individual ships increasing rapidly, wanted something more than that and before long the Conservancy was being criticised as bitterly as Trinity House had been. As soon as the Tilbury Dock system was opened in the mid-'eighties, the Orient Line transferred its terminal downstream, maintaining that it was far too risky to take such a huge ship as their 5,386-ton *Orient*, then the biggest ship running to the Port of London, to the docks in the Middle Reaches. The Shaw Savill and Albion Company did the same when the *Gothic* came out in the early 'nineties and the Atlantic Transport Line with the 13,000-ton ships of the *Minnetonka* type at the turn of the century. It makes an interesting comparison with the manner in which the *Mauretania*, of nearly 36,000 tons, was taken to King George V Dock shortly before the outbreak of the present war.



[Nautical Photo Agency.

The Tilbury Company's hopper "Princes Channel" alongside one of the Company steam hoppers which tows her up to the Deeps to deposit her spoil.

The Thames Conservancy was admittedly always short of money, for its borrowing powers were limited, but it was frequently tactless towards the complaining shipowners when problems of dredging were raised. In 1887, the shipowners petitioned for a deep channel from Gravesend to the Middle Reaches docks, but nothing was done. The Thames Conservancy Act was passed in 1894, providing for improved dredging, but a clever clause which had been inserted into the bill completely nullified it. The Lower Thames Navigation Commission investigated the matter very thoroughly in 1896, and drew up a big dredging scheme. This the Thames Conservancy would not accept on the ground that its finances made it impossible, but put forward an alternative. The compromise was for a 26-ft. channel from the Nore to Gravesend, 24-ft. from Gravesend to Crayfordness, 22-ft. from Crayfordness to the Albert Dock and 18-ft. from the Albert Dock to Millwall, but even this was not carried out and the feeling of discontent grew rapidly.

Sea Reach Channel

One of the greatest problems was concerned with the vagaries of Sea Reach, where a broad and deep channel was absolutely necessary, but where the natural channel was constantly altering with the characteristic changes in practically every decade. Matters were made worse by the fact that the Conservancy had no permanent surveying service and Sea Reach was not properly surveyed until 1894, when the Conservancy Act was passed and several rather surprising factors were revealed. Any number of irregular sandbanks and obstructions of which no warning had been published were found. Some of these were due to the fact that the Conservancy hoppers had, for many years, dropped their dredging spoil in Dead Man's Hole, off Canvey Island. This was constantly surveyed and there had been no signs of it filling up, but the river bed outside it never received attention and it transpired that the tidal eddies which formed the Hole had for years been sucking the spoil out of it and creating shoals nearby. This practice of dropping the spoil in Dead Man's Hole had a lot to do with the constant changes of the shape and extent of the Leigh Middle Sand, close alongside the North or Leigh Channel which was the principal track, but apart from that the shoals had been constantly changing from time immemorial. In 1776 the North Channel was so shoaled that it was described as useless and the Mid-Estuary Channel was opened. Between 1836 and 1841 this Mid-Estuary Channel was constantly reported as being congested with obstructions and uncertain; by 1863 it had so deteriorated that it was abandoned, but the North Channel was then open and deep. No dredging was done in Sea Reach in the Nineteenth Century.

The question of dredging was not the only point on which the London shipping interests were discontended, although it was the most important and most discussed. The rivalries of the dock companies, and the manner in which cut-throat competition had deprived them of the chance of making the docks up-to-date, helped to handicap the port. For years there was an agitation to secure a central authority on modern lines with all parties properly represented, but there was strong opposition, although a royal commission produced startling facts concerning the wasted opportunities of the port.

Formation of Port Authority.

When the Port of London Authority came into existence, it had to tackle the twin problems of the docks and the river. Perhaps the former was more picturesque; it certainly attracted more attention from the general public, although the dredging programme was of great interest and importance and its progress was carefully watched by the shipping industry. It had no reasonable complaint, although there were some individuals who were naturally impatient. The Authority took over the dredging material of the Conservancy and dock companies, some of which was very good indeed. The acquired material was not sufficient for the purpose and had to be augmented, while it was decided that the fleet of dumb hoppers was unsuitable for the ordinary dumping work; it was replaced by steam hoppers, but later the Tilbury Contracting and Dredging Company undertook the dumping work and only one or two of the steam hoppers were retained for special purposes.

The P.L.A. scheme was for a 30-ft. channel from the Nore to Coldharbour, 1,000-ft. wide, a 27-ft. by 600-ft. channel from Coldharbour to the Albert Dock and a 20-ft. by 500-ft. channel from the Albert Dock to the West India Dock. This programme was honestly carried out although it cost £2,000,000 in 25 years and had to be suspended for the late war and resumed in 1922. Perhaps its most striking aspect was the manner in which it permitted access to the Middle Reach Docks by the largest ships; that was to satisfy industry's constant demand for facilities near the heart of the city, but it could not be taken further on account

The Development of London River—*continued*

of the various tunnels under the river whose crowns limited the dredging.

Sea Reach was a particularly interesting feature in the plan, for previous authorities had always considered that it presented too many problems to touch, no matter how desirable it might be. The new regime started with a very careful study of the natural stream, resulting in a dredging plan with curves which have proved most effective in using the tidal scour for the maintenance of the channel. The old channel alongside the Leigh Middle Shoal was abandoned and attention concentrated on the Yantlet Channel which had been inexistence from time immemorial but had been little used. When the work in Sea Reach was resumed after the late war it was greatly hampered by heavy weather and innumerable war wrecks, many of which were broken up and removed by the powerful dredgers.

The Authority was severely criticised in some quarters over the Sea Reach operations. It was suggested that the only way to keep the channel clear was by means of training banks between the Chapman and Southend. Knowing the very unexpected results of such banks in some other ports, and having made an estimate of their high cost, the Authority decided to avoid them if possible and contrived to do all that was neccary by the full utilisation of the natural stream.

In addition to the ordinary dredging work on the river there is a certain amount of ballast dredging still done—for the concrete and building trades nowadays and not for the stability of sailing ships. Some contract dredging work is carried out by private contractors, generally round wharves or other private property, and a great deal of minor work is done by the powerful tugs attached to the P.L.A. Dredging Service, fitted with rakes and blowers which can do good work in odd corners, dock aprons, sills and such places although they demand very careful handling and timing to make their work effective.

The River Embankments

Another point to which great care has to be given, especially where use is being made of the tidal scour, is the state of the banks for which the responsibility is divided. The artificial embankments, or " walls," of the River Thames are of unknown age, but there is good evidence that some of them go back to Roman times. Before their construction the marshes were inundated for miles on both side of the river and any breach in the banks has always been followed by serious trouble. Generally speaking, the tidal erosion is on the north bank of the river, where it has been more or less checked by the construction of jetties, etc., to take advantage of the deep water which it has caused. This is particularly noticeable in Sea Reach.

When the Port of London Authority took over the conservancy of the River, it extended the schemes of the Thames Conservancy to cover Sea Reach and it is now questioned whether it will not be forced to go very much further out to sea and to give a lot of attention to the approach channels. From time immemorial these have given a great deal of anxiety to the Port of London, their position and condition working in cycles. Modern conditions of trade, with the bulk in normal times coming from the southward, has made it a matter of great concern. The greater part of London's tidal water comes from the North Sea and the main channels or deeps run North-east and South-west. Although these vary in depth, and have a tendency to shift among the sand banks within limits, they are not nearly as troublesome as the minor channels or swatchways which are cut through the long sand banks by the smaller body of water coming through the Straits of Dover. These swatchways are all-important for the trade of London, but the channels—Overland, Queen's, Prince's, Alexandra and Edinburgh—are constantly changing, shoaling and opening. The Shingles Patch which has grown rapidly in the centre of the Edinburgh Channel is particularly troublesome. For the Southern traffic to go right round the ends of the sand banks and through the deeps would be a serious matter economically, yet improving the channels by artificial means would be a colossal problem that would demand the very greatest care.

Proposed Free Port Zone at New Orleans.

It is announced that the Port of New Orleans has applied to the Department of Commerce of the United States for permission to establish a free foreign trade zone at the port.

The Problem of Post-War Shipping

The following extracts from Mr. P. de Malglaive's recent Paper on the above subject relate to port questions:—

" The entire problem of conveyance by sea, land and air must be considered, solved and co-ordinated, as a whole and in such a way that waste and useless competition will be avoided. In that respect, a governing body having full control of all forms of transport and transit facilities, such as harbour installations, handling at docks, man power, customs and transit formalities, would be very highly desirable.

" The time gained at sea " (by faster and more efficient ships) " must not be lost in port. The ship is a very costly machine which must work at the highest rate possible. Fast ships must be connected to better arrangements in harbour, coupled with a general speeding up of cargo movements. It is a crying anachronism to see ships lying alongside the quay or in roadsteads, waiting for sunrise before being passed by Customs or medical officers, or else staying idle because work is limited to eight hours a day; also, to see cargoes stacked in sheds for days because some formality has not been complied with. In future, ships should be worked on a 24-hours basis with the utmost dispatch, and working itself must proceed along more efficient and better lines. We are still, in most cases, using the time-honoured system of hoisting slings of cargoes 40 to 60-ft. aloft to drop them at about the same distance. The work of stowing or unloading is spasmodic and instead of a smooth flow, it proceeds in bursts of activity interspersed by moments of idleness, according to the working of the winches.

" Efficient cargo handling should be given a great deal of thought by those responsible for the design of ships to come: for instance, the use of side doors giving direct access to 'tween-decks by trollies should be extended. We know that naval architects do not relish the idea of openings in the fabric of their hulls and that marine superintendents and some masters share this view. But with proper design and care, these openings are most useful and their use should become a normal factor in all general cargo ships, as it is in many American vessels.

" As regards future docks, instead of the linear system in vogue here and in the majority of Continental harbours, there should be adopted the individual-berth type, such as that adopted in the U.S.A., with berth width as nearly as possible the width of the ship to be accommodated, so that work on both sides should be the normal rule, except, of course, when transhipment will have to be done by lighters, for which the Dutch system at Rotterdam was near perfection.

" Shippers could help a good deal if some kind of standardisation could be introduced into the weight, size and shape of packages. It is a difficult problem, as the requirements of individual firms and the need of the clientele vary greatly; but it would be worth trying, and if only partial success could be achieved, the efforts would not have been lost.

" The author considers that the loss of time to ships and damage to cargo would be greatly reduced if the men entrusted with the responsibility of solving the puzzle of planning the stowing of a large mixed cargo, could know beforehand the exact characteristics of each standardised component.

" Customs regulations (some dating from the sailing-ships era), delivery of goods, loading of trucks, should be drastically revised in order to speed up the process."

New Florida Canal.

The United States Senate has passed, and President Roosevelt has signed, a bill authorising the construction, at an estimated cost of 44 million dollars, of a high level lock canal across Florida from the Gulf Coast to St. John's River, linking the Gulf intracoastal waterway with the inland waterway along the Atlantic coast line. There will be five locks to carry barge traffic across between 42-ft. and 55-ft. above sea level. The estimated time for construction is 3 years. The Gulf waterway is to be deepened and enlarged from the vicinity of Apalachee Bay to the Port of Corpus Christi and extended to the borders of Mexico.

*Paper published in *The Journal of the Institute of Transport* for July, 1942. Mr. de Malglaive was formerly Director of the French Line.

Port Administration and Finance

Report of Committee to Thirtieth Annual Convention* of the American Association of Port Authorities

Presented by the Chairman: MARK H. GATES.

To the **American Association of Port Authorities:**

Your Committee on Port Administration and Finance respectfully reports on the following subject:

Finance and Accounting

Difficulties have arisen in the past in attempts to secure comparable financial and statistical information from the various ports of the nation, because of the diversified financial and accounting methods used. With the idea in mind of eventually developing and recommending the adoption by all the ports of certain general accounting procedure that will reflect comparable results, your Committee has inaugurated a study of the systems now in operation.

Because of the present emergency and the resulting calls upon the time of all of the port executives, the Chairman of this Committee has taken it upon himself to present to this meeting a report upon the accounting system in operation in the port with which he is connected. This to be followed at the next meeting by a report on the accounting systems of as many ports as can be covered in the intervening time.

Accounting System of the Board of State Harbour Commissioners for San Francisco Harbour

In order to understand the accounting problem of a California state-owned and managed port facility, a general knowledge of the financial system of the state government is essential. The finances of the state are controlled by the legislature and by special laws voted by the people. At each biennial session of the legislature the Governor presents his budget, showing actual revenues and expenditures for the past biennium and estimated revenues and expenditures for the succeeding biennium. Broadly, the financial organization of the state is composed of two types of departments, the departments supported wholly by taxation, and the " self-supporting " departments whose support is derived from revenues received from special sources. The revenues for the tax-supported departments of the State go into the general fund, while the revenues for the self-supporting departments go into separate special funds. Expenditures for the general support of the State are financed from the general fund, and expenditures for the support of each self-supporting agency are financed from the special funds. The Director of Finance is charged with the administration of the finances of the State under the administrative approval of the Governor; the Controller is charged with the duty of auditing all claims against the State; the Treasurer is the custodian of all moneys of the State, and receives and disburses such moneys on order of the Controller.

The financial organisation of the State is of the decentralised type that is, the legislature appropriates money for the support of each agency, separately. Each agency has its accounting staff and keeps detailed account of its own receipts and disbursements. All cash collected by an agency is remitted monthly to the Treasurer with an accounting of it to the Controller. The expenditures of an agency are administered by means of a fiscal year budget based on the legislative appropriations. The annual budget is prepared by the agency and approved by the Director of Finance. After the fiscal year's budget has been approved, the officer in charge of the agency administers the affairs of the department without further detailed supervision by the Director of Finance. All claims, such as invoices and pay rolls, are sent to the Controller for audit. The Controller sends to the agency his warrants on the Treasurer for the audited amount of the claims, after which payment is made to the claimants. Each agency sends to the Director of Finance monthly condensed statements showing revenues received, budgetary condition, and expense analysis. Thus, by means of the budget system and monthly reports, together with an annual audit of the agency's books, the Director of Finance maintains administrative control of the finances of the State.

The accounting procedure for an agency must be so planned that fund accounting will be strictly in accordance with legislative appropriations, reflect the progress of the fiscal year's operating budget and furnish data for monthly reports showing results of the budget operations as well as furnishing quickly and accurately to the agency management the financial status of the department. In addition to the fund and budget requirements, cost analyses are essential. These cost analyses must be kept in sufficient detail and in such arrangement that costs of the various activities of a department may be accurately shown and readily reported monthly and yearly.

Port Administration

Since 1863, the Port of San Francisco has been operated as a state agency and has been self-supporting. The affairs of the port are administered by the Board of State Harbour Commissioners, composed of three members appointed by the Governor.

The water front extends along the Westerly side of San Francisco Bay from the Presidio to the San Mateo County line, a distance of about 10 miles. In land area there are approximately 1,912 acres comprised of reclaimed and submerged lands. The structural improvements consist of 20,000 lineal feet of sea wall with a paved embarcadero 200-ft. wide extending the whole length of the sea wall; 195 acres of pier and wharf area; 17 miles of berthing space; passenger, railroad car and automobile ferry slips; ferry building and union depot; viaduct, subway and underground electrical systems. The equipment consists of dredgers, launches, tug boats, scows and various types of automotive equipment. A belt line railroad, consisting of about 67 miles of main line, pier and industrial spurs, is operated by the State as a switching medium between the piers, terminals and industries. The switching equipment consists of switching locomotives, locomotive cranes and flat cars. A round house and machine shop is also maintained.

Lying strategically as it does at the head of navigation of two large river systems, the Sacramento and San Joaquin, and contiguous to the harbour of San Francisco Bay, the port is called upon to furnish facilities for inland waterway, coastwise, intercoastal, and foreign-borne traffic.

Port Revenues

The revenues of the port are derived from the following sources:

Dockage charges against vessel operators for berthing of vessels at piers and wharves; wharfage (toll) charges against cargo handled over piers and wharves; demurrage charges against cargo; switching charges for cars switched from pier to pier, and to and from industries; charges for rental of preferential pier assignments, office space on piers and in Ferry Building, railroad car and passenger ferry slips, concession space, privileges, and land areas; electric current and service charges for connecting shore and ship electric systems, and furnishing electric current to ships and tenants; refrigeration service charges for shipside cold storage; miscellaneous charges for rental of equipment, etc.

The system in use has for its objectives: complete financial control through the State budget system, protection of revenues and properties, speed and accuracy in dealing with shippers and marchants, analyses of revenues and expenses, prompt and accurate daily, monthly, and yearly financial statements and reports.

The system is designed to afford means of promptly recording, auditing and collecting all items of revenue with the least possible inconvenience to vessel operators and shippers. The system provides for daily reports from each pier or terminal, showing arrival and departure of vessels and the proper charges for dockage, demurrage, and wharfage against vessels and cargo. The Board, under certain conditions, extends credit for thirty days. With few exceptions vessel operators and shippers have availed themselves of this privilege. In the absence of credit arrangements, charges for services are collected in cash at the pier before departure of vessel or the removal of cargo. After the vessel operator has arranged with the Chief Wharfinger for berthing space, the vessel proceeds to the assigned pier and commences operations without any further formality. When the vessel has completed operations, the shipper or vessel operator furnishes the wharfinger on the pier with a statement showing tonnage and wharfage charges for the cargo loaded or discharged. The wharfinger, immediately after

*Held in November, 1941.

Port Administration and Finance—continued

a ship finishes operations, prepares a statement of dockage charges. The States does none of the stevedoring work, such service being privately arranged for by the vessel operator.

Wharfingers' Daily Reports

At the central office, each day's wharfingers' reports are audited and summarised in report form, showing ships and net registered tonnage arrived and departed from each pier of the port, local earnings for wharfage, dockage and demurrage. After the daily reports are audited the operators and shippers are billed. The billing is accomplished with the aid of a tabulating machine. With one checking and proving of tabulating cards against documents of original entry, billing and sales sheet data as well as statistical information is gained. Charges for all services are handled through the accounts receivable ledger. The bills, together with statements of shippers' ledger accounts for the month, are mailed together. One copy of all bills is furnished to the cashier to be used as collection data. For the benefit of those shippers who desire to pay for all charges for each voyage separately and at the time of the sailing of the vessel, an interim bill is typed and furnished at once.

For the most part assignments for preferential pier space, office and concession space and privileges, as well as for land areas, are given only on a month to month basis. Such assignments are evidenced by agreements accompanied by a small drawing or plat showing the space assigned. All assignments are accounted by number. The accounting records are loose-leaf cards arranged in a card file according to location of the space assigned. On the first of each month bills and billing sheet are prepared on the tabulating machine in the same manner as for tolls, dockage and demurrage, after which a statement is prepared showing analysis of rent revenue and area by pier or other facility, and by class, i.e., inland waterway, coastwise, intercoastal, foreign, general office space, ferry slips, concessions, and rights of way.

Expenditures

Expenditures are classified as Administration, Port Operating Expenses, Port Maintenance, Construction Work in Progress; Belt Railroad Administration, Cost of Conducting Transportation, Maintenance of Roadway and Equipment. These classifications or control ledger accounts are analysed in the expense ledgers into functions indicative of the reason for the expense, and each function further analysed by object of expense, i.e., salaries and wages, materials and supplies, service and expense, and minor equipment. Expenditures for construction work are anlysed in the construction ledger by project. The cost of construction projects is carried yearly into the investment account and is recorded in the property ledger. The analysis of expenses in this manner answers a two-fold purpose. First, it furnishes the basis of budget-making and control; second, it furnishes the management with accurate and detailed information regarding costs of operation.

The budget is controlled by means of a work order system. The authority for incurring any expense is represented by a work order, showing purpose of expenditure and estimated amount and approved by the Board. The yearly operating budget is set up in an encumbrance register, which record is designed to show the allotments for the various purposes set forth in the budget. After approval, a work order is recorded in the encumbrance register, the amount deducted from the proper budget allotment and the remainder of the allotment brought down as an unencumbered budget balance. It is intended that the encumbrance registered shall show at all times the unencumbered budget balance. This procedure places the responsibility upon the department head of working within the limit of the amount allotted by the work order authority. All expenditures against work orders are accounted in an allotment ledger. This ledger is designed to show the amount of authorised expenditure of all work orders issued, the withdrawals of funds, and the unexpended balance of each work order. As no expense may be incurred without a work order authority, it follows that total expenses must equal total fund withdrawals. In order that the management may know that the budgetary provisions are adhered to, a monthly report showing the status of each work order and total work order authorisations reconciled with total expenditures is prepared and presented by the accounting department.

This procedure makes it possible for the accounting department to furnish the management upon short notice the amount of budgeted allotment available for expenditures for the remainder of the fiscal year, and the progress of budgetary expenditures from the beginning of the fiscal year. The advantage of being able to furnish information of this sort with ease and certainty will be appreciated by anyone having experienced the necessity of quickly furnishing a cash and budget statement of a sizeable state agency with many diverse activities.

Investments

Investment in properties is accounted in detail under three heads in the ledger: (1) Land, including cost of land purchased, cost of reclamation projects, and appraised value of reclaimed and submerged land. (2) Buildings and structures, including piers and wharves, seawalls, ferry slips, ferry buildings, grain and fruit terminals, shipside refrigeration plants, railroad tracks, roundhouses, tunnels, subways, viaducts, and underground electrical systems. (3) Equipment, including automotive equipment, dredgers, tugs, scows, electrical equipment, pile drivers, launches, locomotives, locomotive cranes, miscellaneous construction machinery, shop machinery, office furniture, etc.

In the attempt to make of the accounting department a valuable aid to management, the mere recording of historical facts with a view to keeping the books in balance and the rendering of a balance sheet and profit and loss statement at the end of a fiscal year has been taken for granted as a part of the routine work of account keeping and has been subjugated to the more valuable effort to keep the management advised daily, monthly, and yearly of the activities affecting port finances.

Daily reports are prepared showing arrival and departure of vessels, revenue booked for wharfage, dockage and demurrage, analysed by pier facility; cash received, analysed by source, and the banks in which deposited, and budget analysis of day labour pay rolls.

Monthly reports are prepared showing analysis of wharfage revenue and tonnage, dockage, demurrage, and rental revenue; report of status of budget allotments; analysis of accounts receivable showing amount and ages of items composing each account; analysis of expenditure accounts for water-front and belt railroad operations. In addition to the monthly reports, a monthly balance sheet and profit and loss account are prepared, and also a detailed statement of expenditures for construction work in progress, analysed by project.

The same reports and statements which are prepared monthly are also made at the end of each fiscal year showing the total of the results of the year's activities.

The handling of a great deal of detail is necessary in properly booking, auditing and collecting the revenues, due to the diverse activities of the port organisations; likewise, a great amount of detail must be handled to properly analyse the expenditures in order to gain budgetary control and to marshal pertinent facts relating to financial administration. In order to handle this mass of detail expeditiously and economically, full use has been made of mechanical aids, such as adding and calculating machines, bookkeeping and tabulating machines, as well as modern filing equipment.

(Submitted as progress report, with recommendation that subject be continued).

Disposal of Waste Rope.

The Control of Rope (No. 1) Order which came into force on November 1st, fixes the maximum price of waste rope, containing manila or sisal of not less than 4-in. in circumference, when sold to a rope maker, at 32s. 6d. per cwt. loaded free on barge or lorry at seller's warehouse or depot. Under this Order no person is permitted to sell or offer to sell waste rope of this description and specification to a rope maker in excess of the price stated above. Conversely, it is an offence for a rope maker to buy or offer to buy rope of this description and specification in excess of that price. Shipping Companies and Dock Authorities and other producers of waste rope are asked to keep their accumulations of waste rope, of manila or sisal, of not less than 4-in. in circumference apart from their other waste rope. By doing so they will effect a considerable saving in labour and assist the quicker diversion of this material into the right channels.

Correspondence

To the Editor of "The Dock and Harbour Authority."

British Canal Traffic.

Sir,—

In letters published in your August and October issues I have pointed out that inland transport costs in this country are very considerably higher than those in nearby Continental countries, which, inevitably, must have a far-reaching effect on the ability of our industries, and especially the heavy industries, to compete and export their goods.

I have pointed out, also, the great part which Government-owned efficient canals play in the process of keeping inland transport costs low in other countries, and how sadly Great Britain is lagging behind in this respect. In order to bring my point home as forcibly as possible, I will now deal with the position of comparing Great Britain's canal and inland shipping conditions with those in the Netherlands, as this latter country ranks very high in water-borne transport.

The Netherlands, a country of about twice the size of Yorkshire and with a total population similar to that of Greater London, have a remarkably vast and efficient canal system. All these canals are owned by the Netherlands Government. It is rare there to find canals which cannot accommodate vessels of 200 tons deadweight. Many canals can accommodate vessels of 500 tons or more. The Juliana Canal, linking up the coalfields in the southern part of the country with the big rivers, was designed for vessels of 3,000 tons. As for the rivers, it is not unusual to see vessels on the Rhine of about 3,500 tons.

Before the war, Netherlands semi-seagoing motor vessels, used to load cargoes in German Rhine ports, even as far as Frankfurt, proceeded to the North Sea via Holland, made for the Baltic, entered into the German Baltic port of Stettin and proceeded to Berlin, where they discharged their cargo, in competition with the much shorter route by the German railways.

It is the size of these canals and regulated rivers, allowing fair-sized vessels to navigate on them, which has led to the building up of Holland's considerable and modern inland fleet. This inland fleet before the war had a carrying capacity of about 4½ million tons, which is more than the tonnage of Holland's seagoing fleet.

They have left the era of wooden vessels behind them a long time ago. The usual type there is Diesel motor-driven, except on the Rhine, where on account of the strong current, the vessels are being towed in groups by powerful tugboats.

There is no need there to limit vessels to something like 50 tons and a width of about 9-ft., as you can see on the British Canals. The vessels, as mentioned, are of a fair size and as a consequence have room for decent living quarters for the skipper and his family. They indeed make a good home for the people on board. On the larger vessels, particularly the big Rhine craft, the living quarters are so good with their spacious rooms, up-to-date kitchens and bath rooms, that many "landlubbers" with £800 houses cannot compete with them.

It is an interesting feature that the great majority of these craft are owned by the skippers. This private ownership has an excellent effect. It is obvious that the skipper-owner will keep up his ship better than many hired captains would do, that he will not lose time, and that he will do more to please good customers.

This brings me to a point which is important and which seems rather amazing, when one draws the comparisons between the two countries closer.

Everybody knows what the building societies in Great Britain have done to make it possible for the middle classes and the higher tiers of the labour classes to become house owners; in fact, the position in Great Britain in this respect is outstanding.

In the Netherlands I know of at least six big ships' mortgage banks which work on the same lines as our building societies, except that their business is ships. These ships' mortgage banks, rather than investing all their money in a few expensive ocean ships, show a preference to investment in several small vessels, and here was the opportunity for the prospective skipper-owners of river and canal craft. I have known many of these men, who, with an amount of barely £1 000 in their hands, became the owners of fair-sized vessels. They obtained a substantial loan from the ships' mortgage bank for ten or fifteen years, the shipbuilders left some money in the ship for a few years, and the business was done. It is a fact that these ships' mortgage banks did very well, too, for their shareholders.

It is rather amazing that, in view of the heights to which the building societies have risen in this country, there are no ships' mortgage banks in Great Britain. If private initiative in this respect remains lacking, there should be something for the British Government to do.

It seems, in any case, a much sounder system for the Government to invest money in a ships' mortgage bank, with the assistance of which the small man—the respectable and hard-working skipper—can become the owner of a vessel, than paying subsidies to limited companies with heavy overhead expenses.

And coming back to the Netherlands' skippers, I have mentioned only the outlines of their work and how it was all possible. Very much more can be said about their achievements, and how they easily held their own against railway competition, and how, when road traffic developed with Diesel motor lorries, which in the Netherlands is unrestricted, they surely had an eventful time, but still held their own. Just before the war over 60% of all traffic in the Netherlands was water-borne.

The point which I want to make, lies in the result, namely, that inland transport costs in the Netherlands are very much cheaper, often 60 to 75% cheaper than in Great Britain, and how the Netherlanders arrived at this position.

What an opportunity for the post-war planners in this country to do something really constructive, because, apart from the vast number of workers that would be needed for the reconstruction of canals and everything that belongs to it, as described in my letter, it is *fundamental* work. It would give Great Britain's industry a better chance after the war when the country will have to compete with other countries, because transport costs are often such a big item in the cost price of commodities.

It is all very well and interesting to offer the population nice dwellings to live in, to add to the amenities in many ways and to create social laws and so on, but the hard fact remains that the masses must be able to spend the money, to live in these houses, to make use of the amenities without worry, and the Government will require money for social laws.

Great Britain is, and of necessity has to be, an industrial country. It will add to the industry's lifeblood to make inland transport so cheap that it can be compared to these costs in other countries. It is, in fact, building up the basement first before work is started to build up the further part of the building.

Yours faithfully,

London. "JACK HOLLAND."

2nd November, 1942.

To the Editor of "The Dock and Harbour Authority"

The Institute of Transport: Attitude of Port Authorities and Shipping Concerns.

Sir,—

I was glad to see the observations in your September number drawing attention to the value of the Institute of Transport to men engaged in shipping and dock administration, especially to younger men who take the Institute's exams. A glance at the papers set will show how valuable can be a scientific approach to the work that will lie ahead of them. There is no doubt that a combination of the practical and scientific approach is becoming more and more essential and the personal contacts and opportunities of hearing and reading papers, joining in discussions and reading the Journal, all combine to give men who are ambitious to do their work as well as it can be done and to fit themselves for greater responsibilities, opportunities of enriching their minds and even distinguishing themselves, such as their mere daily work could not afford.

The accession of increasing numbers of shipping and docks administration men to the Institute would still further extend these opportunities. Great benefit could be derived by the formation of groups of the one or other class or, where considering common problems, of both. Such groups can invite visitors with particular experience to come and talk on their own subjects quite informally, an invitation that a busy man can more readily accept than one to read a paper. The kind of subject that occurs to me that would be of common interest to shipping and dock men would be

Correspondence

(concluded from page 182)

that of the physical aids to speedy handling of cargoes, methods contributing to efficiency, arrangements to avoid keeping ships waiting, the scientific adjustment of charges and so on. There is no antagonism between the practice and the scientific approach. The practical man of the future must be increasingly scientific if he is not to remain in a subordinate position and men at the head of affairs must exchange experience and ideas.

Twenty-five years as General Manager of the Chamber of Shipping, scarcely less as Secretary or Chairman of the Traders Co-ordinating Committee on Dock Charges, and experience as a shipping lawyer and club manager and, latterly, as a member of the Council of the Institute and a Vice-President, have given me opportunities of appreciating the value that active membership of the Institute could have for a man and his work. The cost is trifling and cannot be compared with a costly University or professional training, though its value may be comparable, and those who are wise enough to join are likely to find it one of the most profitable investments they can ever make. My one regret is that the Institute was not in existence for me to join it 35 years ago.

Dock authorities and shipping companies could, with advantage to themselves, encourage members of their staffs to join.

I am, Sir, your obedient servant,

H. M. CLEMINSON.

Writtle, Essex.

October 27th, 1942.

The War Damage Act, 1941, in relation to Dock and Harbour and Canal Undertakings

A White Paper (Cmd. 6403, H.M. Stationery Office, Price 3d.), presented to Parliament by the Chancellor of the Exchequer, outlines the scope of further legislation contemplated in extension of the War Damage Act, 1941, with special reference to Section 40 of that Act. This section temporarily excepted certain types of undertakings from the operation of the Act, pending further legislation, and these, on further study, have been found to fall into three groups, which are classified in the White Paper respectively as "public utility undertakings," "extensive undertakings" and "other undertakings." It is now proposed to initiate legislation repealing Section 40 and providing for precise definition of the undertakings to be dealt with as "public utility undertakings" and "extensive undertakings" as described in two of the three above-mentioned groups. Undertakings of the third group, which do not fall within the definitions of the other two, would become subject to the general provisions of the Act.

It is contemplated that some, but not all, statutory undertakings of the type of railway, light railway, canal, inland navigation and docks and harbours, should be treated as public utility undertakings, though it is not considered possible to define by a general formula which of these are to be included and which excluded. It is, therefore, proposed to confer power under the Act to make orders, after consultation with associations representative of the persons interested, naming individually the undertakings to be classed as public utility undertakings.

For the purpose of applying the contribution arrangements proposed, public utility undertakings will have to be divided into groups, and it is proposed that there should be nine groups, viz., Railway, Canal, Dock and Harbour, Lighthouse, Gas, Electricity, Sewerage, Sewage Disposal and Water, undertakings in Northern Ireland being included with those in Great Britain in their appropriate groups

The Canal group would consist of certain statutory canal and inland navigation undertakings (other than railway-owned canals). Such undertakings vary very widely in size and importance, and, as indicated above, it is not considered that all the smaller undertakings could be conveniently included. The precise line of demarcation remains to be considered. Questions of demarcation may also arise in relation to undertakings which partake of the character both of a canal and a dock. It will also be necessary to consider whether certain undertakings with both land drainage and navigation powers would be more appropriately included in the Canal group or treated as Drainage Authorities.

The Dock and Harbour group would consist of certain statutory dock and harbour undertakings (other than railway-owned docks), but probably no quay or pier undertakings. Here again there is wide variation in the size and importance of the undertakings, of which the smaller probably cannot be conveniently included. The precise line of demarcation remains to be considered.

The Lighthouse group would include only the lighthouse (but not the pilotage) undertakings carried on by the Corporation of Trinity House, the Commissioners of Northern Lighthouses and (except in so far as the undertaking serves the Eire Coast) the Commissioners of Irish Lights. Other lighthouses and aids to navigation would be regarded as part of the undertaking to which they belong.

It is proposed that public utility contributions should be payable by public utility undertakers and should be assessed as follows: In arriving at an aggregate contribution for each group, an estimate would first be made of the total payments in respect of war damage to public utility assets which are assets of undertakings in the group, whether made in respect of land or goods, whether, in the case of land, the payments were public utility payments or payment made under the provisions of the principal Act, and whether they were made to the undertakers themselves or to other persons (e.g., tenants of the undertakers). There would then be deducted from one-half of the estimated total payments the aggregate amount of the contributions payable under Part I of the principal Act by tenants of undertakers in the group. The resulting difference would be the aggregate amount to be contributed by all members of the group.

Minister of War Transport and the Institute of Transport.

On November 3rd, a certificate of honorary membership of the Institute of Transport was handed, in the presence of a large attendance of members, by Mr. J. S. Nicholl, the President, to the Right Hon. Lord Leathers, Minister of War Transport. The Minister, in his acknowledgment of the honour, referred to various activities in the field of transport, including that of coastal shipping, his remarks on which subject are commented on elsewhere in this issue.

Annual Convention of American Association of Port Authorities.

The thirty-first annual convention of the American Association of Port Authorities was opened at Hamilton, Ontario, Canada, on September 12th when it was addressed by Mr. Angus Macdonald, Canadian Minster for Naval Affairs. He said that since the start of the war, 10,000 ships carrying munitions and supplies had left Canada to cross the Atlantic and had done so with remarkably light losses. Mr. John H. Wilson, last year's President, has been succeeded in the chair by Mr. Mark Gates, of San Francisco, California.

American Troops and British Dockers.

The Ministry of War Transport has issued a statement to the effect that thousands of American troops who are now engaged in discharging ships on the North and West African Coasts received their first training in the handling of cargoes in British ports.

This part of the preparations for the Allied operations is revealed in a letter which General Lee has sent to the Minister of War Transport from the Headquarters of the Services of Supply, European Theatre of Operations. After expressing to all concerned his deep appreciation of the co-operation extended to the U.S. Army in training troops for discharging operations, General Lee continues:

"These battalions who, at the time of their arrival in this country were untrained in the handling of marine cargoes, are now actively engaged in the operations in North and West Africa and, thanks to the experience gained by them in the actual discharging of ships here, I am confident that they will render an excellent account of themselves."

It can now be disclosed that during the summer, under arrangements made by the Ministries of War Transport and Labour in co-operation with the Trade Unions, American soldiers worked side by side with British dockers in several ports, to gain experience and to study the dockers' methods.

The Minister of War Transport has asked the Regional Port Directors concerned to convey General Lee's message to both employers and men, with an expression of his own thanks.

Notes of the Month

Aberdeen Harbour Affairs.

The Aberdeen Harbour Commissioners have been asked to receive a deputation from the Aberdeen Chamber of Commerce to discuss the question of the administration of the harbour, with which some dissatisfaction has been expressed at a recent meeting of the Chamber.

New Swedish Dock Concern.

A new company has been registered at Stockholm under the name Aktiebolaget Djurgardsvarvet, its objects being to carry on floating dock and shipyard work, etc. The capital is 55,500 kroner, and the first directors are Messrs. J. G. Frykman, G. G. A. Wadstein and K. A. Dahlström, all of Stockholm.

U.S. Port Appointment.

Mr. E. W. Richardson has been appointed manager of the Marine Terminal, Wilmington, Delaware, in succession to Mr. Chas. Gant. Mr. Richardson has been in the service of the Harbour Commissioners since 1922 and has been traffic manager since 1929.

New Canal Control Order.

A new Order (S.R. & O. 1942, No. 2053) recently issued by the Minister of War Transport, announces the taking over by the Minister of the following canal undertakings: Messrs. J. Barraclough and Co., Ltd., Messrs. W. Bleasdale and Co., Ltd., Messrs. F. Fletcher and Sons (Canal Transport), Ltd., Messrs. G. D. Holmes, Ltd., and Mr. J. J. Tomlinson.

Improvements at Port of Mombasa.

The Kenya and Uganda Harbour Advisory Board have recommended an expenditure of £354,000 for the purpose of providing two additional deep-water berths at the Port of Mombasa, together with £14,500 for an additional storage shed and £10,700 for other facilities at the port.

Tees Conservancy Commission.

At the annual meeting of the Tees Conservancy Commissioners held on 16th November, Sir William Crosthwaite was elected Chairman of the Commission in succession to Sir Francis Samuelson, Bart., who, in the early part of the month, after serving 11 years in the chair during a membership of 41 years, resigned his appointment as one of the Minister of War Transport's nominees. Some six months ago Sir William was elected Deputy Chairman of the Commission and Mr. B. O. Davies follows him into this office.

Bombay Port Trust.

At a meeting of the Trustees of the Port of Bombay held in June, the following expenditure estimates were sanctioned: (1) Rs. 87,800 for replacement of the electric overhead lines at Grain Depot Railway Yard by underground cables, the work being spread over a period of three years from 1942-43; (2) Rs. 46,500 for the construction of a dock boundary wall from No. 4 Shed, New Ferry Wharf, to White Gate, Alexandra Dock; (3) Rs. 20,700 for providing structural protection for certain plant and machinery; (4) Rs. 4,910 for improvements to Port Trust Bunders. The trustees approved a general scheme for the provision of additional railway facilities with a view to speeding up the traffic handled by the Port Trust Railway.

Tyne Improvement Commission.

Mr. J. Denham Christie and Mr. C. M. Jenkin Jones have been co-opted additional dues-payers' representatives on the Board of the Tyne Improvement Commission for a period of three years at a statutory meeting of the elected representatives of the shipowners, coalowners and traders on the Commission. Mr. Denham Christie is a director of Swan, Hunter and Wigham Richardson, Ltd., and was first co-opted a Commissioner in November, 1934. Mr. Jenkin Jones is divisional general manager, North Eastern area, of the London and North Eastern Railway Company, and was first co-opted a Commissioner in November, 1936, in place of Mr. Thomas Hornsby, the late divisional general manager of the L.N.E.R., who retired in 1936.

Wick Harbour Finances.

The harbour revenue at Wick, Caithness-shire, for the financial year ended October 31st, was £6,838, compared with £7,520 last year, a decrease of £682.

Vaccination of Glasgow Dockers.

Mass vaccination carried out among Glasgow dock workers, following the severe outbreak of small pox at the port last June, resulted in less than 3 per cent. of all classes of labour being absent from work as a result of vaccination. The maximum period of incapacity was a week and most men were back at work within 48 hours.

Visit of General Smuts to the London Docks.

A visit has been paid by Field Marshal Smuts, who was accompanied by his son, Captain Smuts, to the docks of the Port of London Authority. The party was conducted by Mr. Thomas Wiles, the chairman of the Authority, and Sir Douglas Ritchie, the general manager and by Admiral Dunbar-Nasmith, V.C., flag officer.

National Harbour Board of Canada.

Lieut.-Col. A. C. Dubuc, chief engineer and vice-chairman of the National Harbour Board of Canada, has retired on superannuation on account of failing health. He has been succeeded by Mr. Joseph Emile St. Laurent, chief engineer of the St. Lawrence River Ship Channel, a position which he has held since April, 1937. The appointment on the Harbour Board is for a term of 10 years.

Death of Former Post Official.

The death is announced of Mr. Frederick Wright, formerly an assistant to the Dock and Traffic Manager of the Port of London Authority. He died in retirement at the age of 66, having spent 46 years in dock service when he was superannuated in 1936. He joined the London and India Docks Joint Committee in 1890 as a junior clerk, and after service in various grades at the Royal Victoria Dock, became in 1927 Superintendent of the Surrey Docks till his final promotion, as stated above, in 1933.

Pressure on U.S. Pacific Coast Ports.

The effect of war-time pressure on the Pacific Coast Ports of the United States is shown by a recent statement by Mr. A. R. Lintner, Pacific Coast director of the U.S. War Shipping Administration, that the Port of San Francisco " is operating at absolute capacity," and that on account of demands made for the shipment of military supplies, " there is absolutely no room for commercial shipping, which must be diverted to other ports."

New Egyptian Port.

Camp " X " is the war-time designation of a modern seaport rising on a bay of the Egyptian Coast, when a year ago there was little more than desert sand. A report in the *Natal Mercury* describes how several thousand men, living in tents, are engaged on the handling of military stores and adds: " The remainder are building extensive concrete quay accommodation. Until the work is completed, the ships anchor offshore in the bay, protected by a boom and the cargoes are transferred to waiting lighters." Camp " X " is typical of a number of new ports in various stages of development scattered along the coast line of the Middle East.

New Regional Port Director for Scotland.

The Minister of War Transport has appointed Mr. Tom Macpherson to be Regional Port Director for Scotland in the place of Mr. Robert Letch, who has been transferred to the North-Western Region. Mr. Macpherson is the well-known produce importer. He was born and educated in Glasgow, and is Chairman and Joint Managing Director of Macpherson Train and Company, Ltd. Since the beginning of the war he has been working mainly in connection with the Ministry of Food and the Ministry of Supply, and has been prominently associated with the setting-up of Ministry of Food controls. Last year he was Chairman of the London Provision exchange. During his business career he has had wide experience of shipping and port problems as they affect commodities.

*Sea-going Hydraulic Hopper Dredgers**

History of their Design, Development and Operation

By Lieut.-Col. H. B. VAUGHAN, Jr., Corps of Engineers, U.S. Army.

(Concluded from page 165)

Kinds and Classes of Dredgers

Dredgers are variously divided into many kinds, types and classes. This division is sometimes a cause of confusion as dredgers do not fall into precise classifications. Frequently, they overlap as to their ability to do certain work and their kinds of machinery. From the standpoint of kinds of material, they are designated as rock dredgers, sand and gravel dredgers and gold dredgers. Again, they are sometimes divided into dredgers for inside use on protected projects and dredgers for outside use or open sea work. Dredgers have also been roughly classified as propelled and non-propelled machines. This is not a very satisfactory classification, since certain dustpan and cutter-head dredgers, which make use of spuds while working, have propelling machinery in them which is not used when the dredger is operating. Another classification may be made according to the power and combinations of power used, such as steam, Diesel, electric, turbo-electric and Diesel-electric.

A better designation and means of differentiation can be made from their particular design, as several kinds of dredgers can handle a variety of materials and, as mentioned above, may be self-propelled. They more naturally fall into the following general types:

1. Clam shell or grab bucket dredgers, operating with the movable boom—drag lines and similar adaptations.
2. Endless chain or ladder bucket dredgers—gold dredgers.
3. Dipper dredgers using a bucket rigidly fastened to a movable arm or dipper stick
4. Hydraulic suction dredgers, which may be divided into several different classes as follows:

(a) Pump barges—dust-pan dredgers—without cutter heads, but using discharge lines.
(b) Cutter-head dredgers using pipe lines
(c) Agitator dredgers—propelled—with or without pipe lines.
(d) Seagoing hopper dredgers.

In discussing the seagoing hopper dredgers in its latest form of development, it is necessary to sub-divide this particular class into three types as far as the placement of suctions or drags is concerned.

1. Side-drag type, such as the *Goethals*.
2. Centre-well type, such as the *Rossell*.
3. Stern-well type, such as the *New Orleans*.

The discussion of design narrows down to the most practical of these; i.e., the side-suction or drag type, of which a recently-designed 5,600 cubic yds. seagoing hopper dredger will be, it is believed, the latest in desirability when built. It is this design, known at the present time, until a proper name has been selected for it, as Hull No. 226, which is described later in this paper. In the course of their development, seagoing hopper dredgers fall roughly into three stages: First, the pioneer wooden hull (often inefficient) steam dredger of small capacity whose operations were frequently interfered with by stress of weather; second, the steel hull dredgers, usually originally designed but occasionally utilising a steel hull already built, which were produced largely in the first decade of the 20th century, and, third, the period which the Government entered upon in the late thirties wherein particular attention was given to careful design in the adaptations of modern power applications and the refinements which naval architecture could achieve.

None of the old wooden hull dredgers remains. The early steel hull steam dredgers are rapidly approaching the end of their economic service ability and need replacement. The last group are dredgers of modern design. Two medium draft Diesel-electric dredgers are now under construction. The Government has entered upon a systematic plan of replacement, depending, of course, at the present time upon the availability of facilities to build.

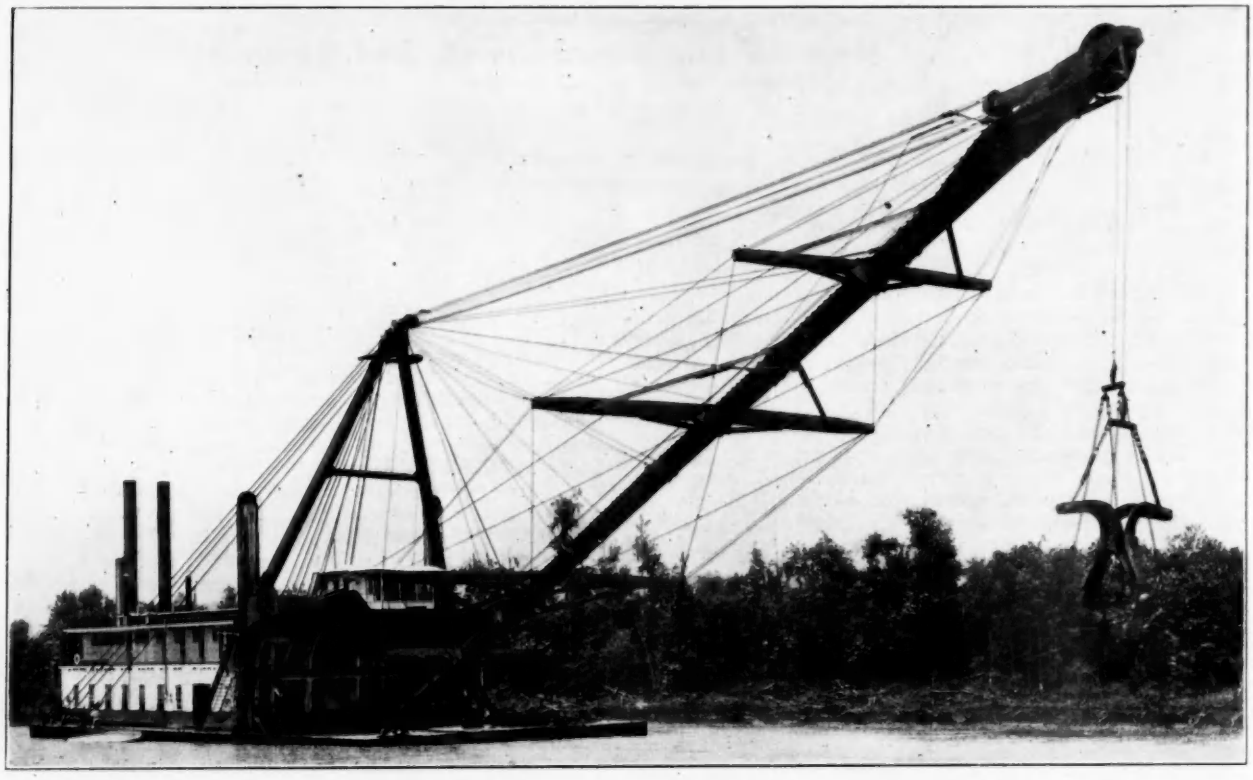
Range of Engineering Involved

Naval architecture and marine engineering play a major part in the design of such a complex plant, whose hull is called upon to provide a dual service: (1) to house the essential machines which go into its make-up, and (2) to furnish the "ship" part of the equation, for speed and manœuvrability are the essence of present and future dredger operation. Speed, not only when running light or returning to a digging ground without spoil

*Reproduction of Paper read before the Society of Naval Architects and Marine Engineers, New York, U.S.A., in November, 1941.

Steel hull dipper dredger "Crest." Shown with 10 cubic yard rock-digging bucket. Can operate 16 cubic yard mud bucket.

Sea-going Hydraulic Hopper Dredgers—continued



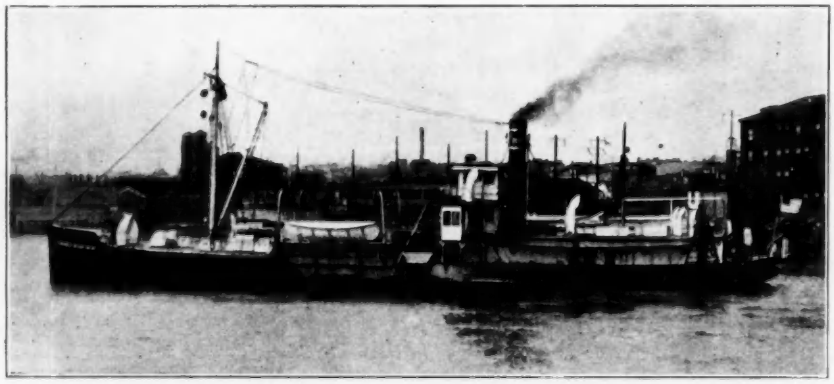
Dredger "Alabama," 140-ft. x 49-ft. x 9-ft.; steel hull, with steel spuds; boom, 204-ft., using 5½ cubic yard Stockton type bucket.

aboard, but when filled with its economic load, even with the retarding effect of suction pipes projecting abeam, is the product of smart development of the bow and stern under both working and speed conditions.

Mechanical engineering has its part in the selection of power, the rapid improvements of Diesel engines and auxiliaries, high steam pressures and its special applications, and an improved centrifugal pump design.

The electrical engineer plays an increasingly important part in the design and construction of the modern hydraulic seagoing hopper dredger. Diesel-electric and turbo-electric combinations, automatic controls, radio, special sounding devices, heating and lighting, all come within the scope of the electrical engineer's special field.

The chemical engineer, in a lesser degree, has his part to play in the analysis of fuels, oils and water, and in physical and chemical testing of metal and materials that go to make up this intricate plant.



Suction dredger, "Absecon." Length, overall, 161-ft. 10-in.; beam, moulded, 35-ft.; depth, moulded, 12-ft.; draft, light, forward, 6-ft. 5-in., aft, 8-ft. 6-in.; draft, loaded, 11-ft. 1-in., aft, 10-ft. 6-in.; displacement (2,240 lb. tons), light, 560; loaded, 994.

The safety engineer, too, has his part, for the highest type of safety engineering is embodied in the design. Preventive safety engineering becomes most effective when considered and co-ordinated with other kinds of engineering.

Of course, unless the basic foundation is properly laid, the efficiency of pumps and power can be lost, time wasted and cost made to become unreasonable because of inadequate engineering on the part of the naval architect.

Conditions which Influence the Present Trend in Design

Few seagoing hopper dredgers are now confined to a single geographical location or are designed for a single geographical project. Their places of need are too many and their numbers too few. Certain physical conditions strongly influence their design. One of the first of these is the question of draft. More ambitious seacoast towns aspire to be seaports and shallow bars and entrance channels require sturdy seaworthy dredgers that have a minimum draft when loaded. The *Absecon* is an outstanding example. It has worked from the Mexican Line to the coast of Maine on shoal bars, and has a fine record for service performed.

Distance of work from a disposal area is another conditions that influences design. Long hauls are expensive for slow dredgers; the highest speed, within reason, is necessary.

Room to manœuvre or congestion of channels must be taken into consideration. The twin-screw *Chester Harding* can turn around in one and one-half times its length.

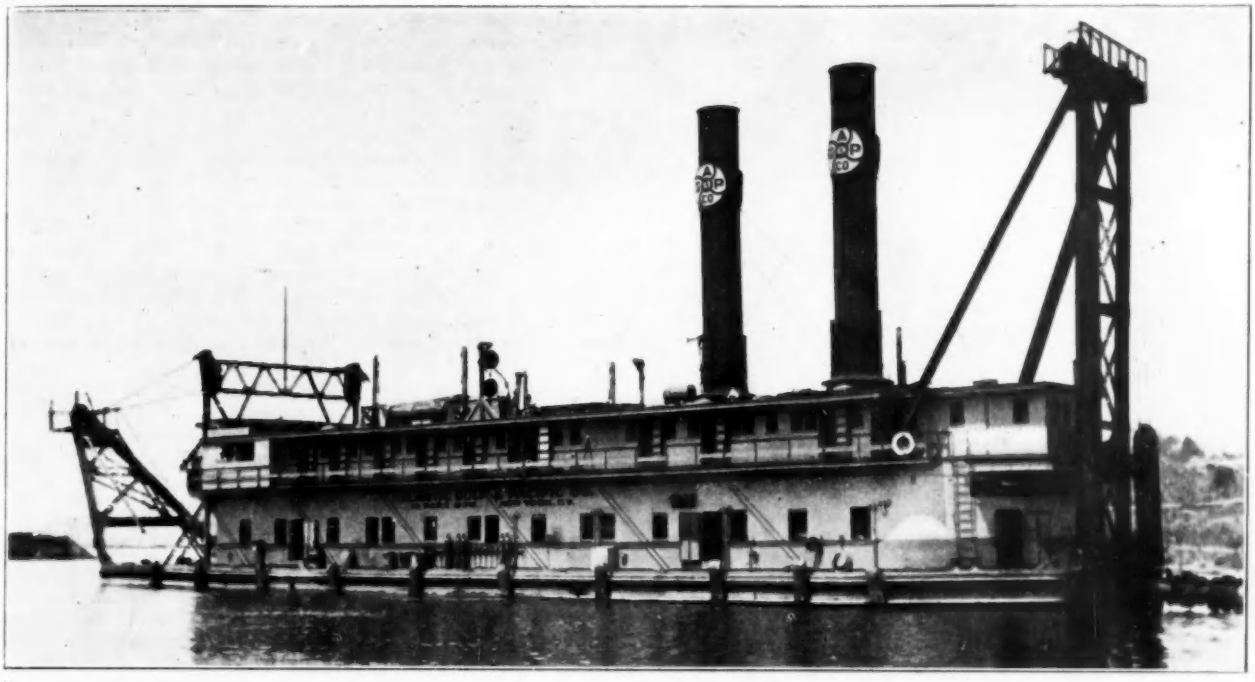
The kind of material to be handled is a big factor, of course, stiff clay, mud shell, compacted sea sand, coarse sugar sand, alluvial silt (one of the worst), gravel and small boulders and coral are all grist that comes at times to the seagoing hopper dredger's mill. Each constitutes its own particular problem and is reflected in the choice of metal in critical parts, the design of the pump, hoppers, hull construction and suction heads.

Sea-going Hydraulic Hopper Dredgers—continued

Selection of proper power must be based on the availability of fuel, accessibility to proper repair facilities and whether operators of a particular class are obtainable (as in the tropics).

Of course, the limitations of appropriations is always something to be reckoned with—decision in design must sometimes be tempered by the funds available.

There is definite trend in the design of seagoing hopper dredgers. Dredgers must keep pace with the rapid advance of power applications to stay ahead of an unprecedented programme of the world's merchant marine, as well as battleship building. The trend of seagoing dredgers is much like that of the automobile—streamlining, more speed with economy, built-in safety, more attention to engineering advancement, better quarters for crews, and good communication facilities.



Ladder dredger, "Baltimore." Hull: Material, steel; length, 172-ft.; breadth, 44-ft.; depth, 12-ft.; diameter of spuds, 30-in.; draft under normal conditions, 8-ft.

Construction

The United States Government has certain marine construction facilities. Those capable of building a seagoing hopper dredger at this time are under the supervision of the Navy Department. The shops and yards of the United States Engineers are largely designed for maintenance and repair of their floating plant, although smaller boats are sometimes constructed.

The new dredgers are designed by or under the immediate supervision of the Marine Division of the United States Engineer Department, at present attached to the Philadelphia Engineer District. The same agency prepares specifications and bids are secured from shipbuilding companies equipped to produce, to a great extent, the component parts of a complicated hopper dredger. After letting a contract, intimate contact and supervision are maintained by Engineer Department representatives and inspectors during construction. Sub-contractors and specialists, experts in their highly specialised field, are dealt with directly or through agreed-upon channels.

Numerous individual tests of machines, materials and equipment are made or checked. Other governmental agencies, such as the Bureau of Standards, the Bureau of Marine Inspection and Navigation, the Navy Department, and commercial laboratories, and laboratories of certain universities are utilised to contribute the benefits of their particular fields of endeavour. All seagoing hopper dredgers are built in accordance with the requirements of the American Bureau of Shipping.

The benefit of best previous similar practice, ideas of competent field operators, masters, chief engineers and operations inspectors are secured, until, finally, trial runs, loading tests and efficiency check-ups are in order. Corrections and adjustments after shake-down runs eventually leave the finished product in the hands of the Engineer Department.

How long does it take to build a *Goethals* or a *Harding*? Many things effect such construction and are reflected in the first cost. Congestion of building facilities is generally the determining factor.

The *Goethals* was built at Quincy, Mass., at the Fore River Yard of the Bethlehem Steel Company, Shipbuilding Division, in 517 days at a cost of $3,629,810.75, when ready to dig mud. The *Chester Harding* was built in 570 days at Wilmington, Del., by the Pusey and Jones Corporation at a contract cost of $1,945,308.78. The contract price for the *Goethals* was $468 per ton, while that of the *Chester Harding* was $554 per ton.

The *Hains and Hoffman* two Diesel-electric seagoing dredgers of lesser draft and capacity (700 cubic yds.) now under construction by the Pusey and Jones Corporation, will be completed in 400 calendar days and 580 calendar days, respectively. Their estimated cost per ton is $800.

From the foregoing instances it is apparent that it is very difficult to answer consistently the frequently asked question of cost and time to produce.

(To be continued)

Gothenburg Harbour Board Estimates.

The estimates of the Gothenburg Harbour Board, Sweden, for 1943, exhibit a deficit of 1,597,500 kroner, the estimated income being 8,400,000 kroner and the expenditure 9,997,500 kroner. This compares with an estimated deficit of 1,797,500 kroner in the current year. Commenting upon the estimates for 1943, the Harbour Board state that the higher price level has not only affected wages, food, clothing, etc., but also various materials required for the working and maintenance of the port. Thus, the price of timber has risen by 20 to 30 per cent., steel lines by 8 per cent., and fuel and lubricating oils by 140 to 150 per cent. Work and goods required from outside have also increased considerably in price, and increased sums have therefore had to be provided for a number of items. The severe winters have also had their effects, but generally speaking, the expenditure upon maintenance has been kept as low as possible.

Temporary Dams

An Article for Students and Junior Engineers

By STANLEY C. BAILEY, Assoc.M.Inst.C.E., F.G.S.

(Continued from page 156)

Steel Dams

With regard to steel-built dams, consisting of a single row of steel sheet piles or needles supported by walings, and steel frames at suitable distances apart at the back, this is not a common form of dam for temporary purposes, because of the heavy cast iron ballast required to stabilise it. It is chiefly employed for permanent dams and weirs where the frames can be firmly fixed in a concrete foundation, and do not require ballasting, but it is a suitable type for a rock foundation. Fig. 12, is a cross section of a steel dam for 25-ft. head of water having a lateral pressure of 9 tons per lin. ft. and as the frames are 6-ft. apart the total pressure per frame is 54 tons + 0.4 tons for wind on the upper exposed portion.

The weight of each frame is 3 tons and they are lowered into position on the line of the dam by a floating crane; the feet of the frames are sunk into the rock in holes excavated by divers, and the holes filled with concrete.

When the frames have been fixed and braced together longitudinally, and the front walings attached, the steel interlocking piles are driven by a floating pile driver close against the walings, and into the sea bed so far as possible, the tops of the piles being then clamped or bolted to the upper waling.

There are several forms of steel interlocking piles used, the strongest are those in which rolled steel joists, or bulb headed joists, and channel steel are employed, with special steel needles for interlocking the flanges, and for those weighing about 43 lbs. per sq. ft., the force required to pull the joints asunder varies from 8,320 to 9,760 up to 10,900 lbs. per vertical lineal inch of pile.

If the rock surface is very irregular, then bags of concrete should be laid on the ground against each side of the sheet piles. Fig. 13, shows the frame diagram and water pressures with reactions, exclusive of the kentledge loads, and in Fig. 13a, the graphic calculations for the dam are shown, the dam acting as a cantilever under a triangular load.

The moment of the water pressure is 54.4 tons × 8.34-ft. – 453.6-ft. tons per 6-ft. length of dam, and if a factor of safety of 2.25 is allowed against overturning, then the moment of the dam and ballast should be 1020.6-ft. tons, and as the C.G. of the dam is 10.5-ft. from the toe, then $\frac{1020.6}{10.5}$ – 97.2 tons of kentledge per 6-ft. length, including the 3 tons weight of each frame will be required, this is exclusive of the resistance of the hold in the rock of the frame and piles.

As the stresses in the members of the frame below the ballast will be altered by the weight of the kentledge, a graphic diagram for these is shown in Fig. 13b, additional compression will come on the back leg and diagonal struts, while on the front leg and struts the algebraic sum of the plus and minus stresses must be taken. The steel joists supporting the kentledge if carried over several spans may be treated as continuous beams.

Timber Dams

Temporary dams built of timber with a single row of sheet piling on the water face, with walings, and diagonal struts or shores at the back at intervals of 5 to 8-ft. are a common form of construction when the sea bed consists of alluvium, sand, gravel, mud, and clay.

If of mud, the piles may require to be driven 30-ft. or more into the ground to obtain sufficient resistance to uplift.

Particular attention should be given to the piles at the back of the dam against which the struts abut, for they sustain a large proportion of the pressure. A single pile is often used for this purpose, but as a rule one pile is not sufficient, a group of two or three being necessary in most cases when the head of water exceeds 20-ft.; otherwise there will be grave risk of the pile and dam being pushed over bodily, a not uncommon cause of failure.

To prevent this, a bank of clay or dredged material should be deposited against the back of the sheet piles.

The diagonal struts should be square in cross section, and their lengths should not exceed 20 times their thickness; the butt ends of the timbers should be cut square to obtain a uniform bearing area, as crushing usually takes place at the ends.

Sheet piles for dams are usually made of whole timbers from 11-in. to 14-in. square, with 2-in. by 2-in. tongued and grooved joints, cut out of the timbers, sometimes in lieu of cutting the timber, say of a 12-in. square pile, two strips of wood, 5-in. by 2-in., are spiked on one face of the pile, and a 2-in. by 2-in. centre-piece on the opposite face. The cast iron shoes are wedged shaped with a slope of 1 in 6 to 1 in 8, on the cutting edge of the shoe. The piles are driven on each side of a king pile ,having an ordinary pointed shoe, and thus wedge themselves against that pile as they are driven down.

Fig. 14, shows a cross section and calculations of the pressure on a timber dam for a head of water of 18-ft., but as the water will percolate into the soft subsoil for several feet a head of 21-ft. has been provided for, giving a pressure of 6.3 tons per lin. ft. and as the struts are 5-ft. apart longitudinally, the total pressure will be 31.5 tons acting at a height of 7-ft. The sheet piles (12-in. by 12-in.) will carry safely as contilevers a certain proportion of this pressure, there are 5 piles per bay, excluding the soldier pile at the back of the sheet piles. If a safe stress of 0.75 tons (1,680 lbs.) per sq. inch in tension is allowed on the sheet piles, the calculations will be as follows, viz.:—$I = \frac{B.D^3}{12} = \frac{12 \times 12^3}{12}$ – 1,728-in. units, $y = 6''$, the safe B.M. $= \frac{S.I.}{y} = \frac{0.75 \times 1,728}{6} =$ 216-in. tons, and the safe load per pile $= \frac{M}{x} = \frac{216}{7 \times 12} = 2.57$ tons, therefore 6.3—2.57 = 3.73 tons net pressure per pile

There are 4 points of equal pressure in the height of the dam, there will, therefore, be 0.93 tons in lieu of 1.575 tons per point, and the pressure on the soldier pile will be 0.93 × 5 = 4.65 tons in lieu of 7.875 tons per point, the total pressure being 3.73 tons × 5′ = 18.65 tons in lieu of 31.5 tons. The soldier pile will carry 2.57 tons safely 18.65 – 2.57 = 16.08 tons effective pressure on the back piles at E, on which the struts abut. The 3 piles at E will each carry $\frac{16.08}{3} = 5.36$ tons as a cantilever, the leverage (a) is 4.5-ft. M = P.a. = 5.36 × 4.5′ = 24.12-ft. tons, and 24.12 × 2.240 × 12 = 648,345.6-in. lbs. and the stress will be $= \frac{M.y.}{I.} =$ $\frac{648,345.6 \times 6}{1,728} = 2,251.2$ lbs. per sq. inch.

If a single pile is used at E, and extended as shown by the broken lines in the sketch, and tied by horizontal timbers to the soldier pile, it may be treated as a beam carrying a point load. The B.M. will be $= \frac{W.a.b.}{1} = \frac{16.08 \times 4.5 \times 12.5}{17} = 53.2$-ft. tons

Temporary Dams—continued

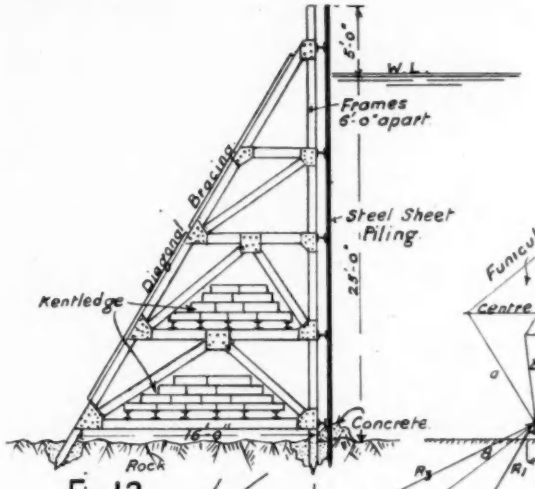


Fig.12.

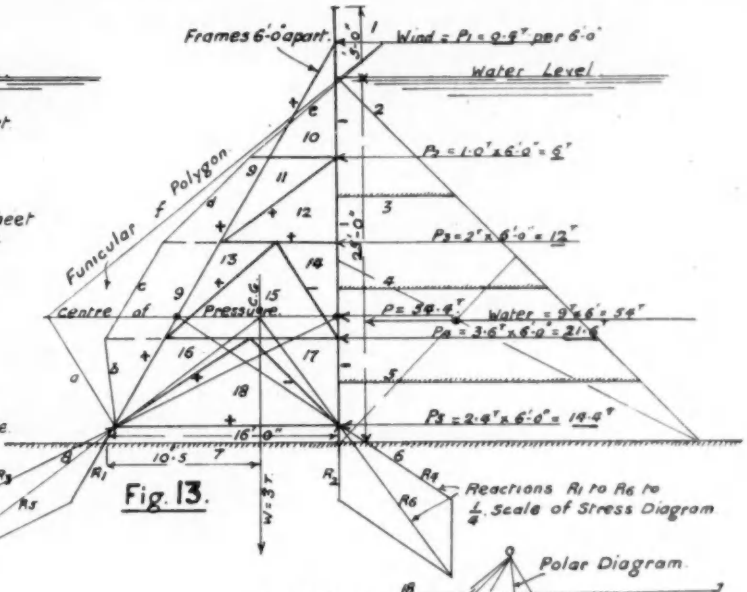

Frames 6'-0" apart.
Wind = P1 = 0·9T per 6'-0"
Water Level
Funicular Polygon
Centre of Pressure
P2 = 1·0T x 6'-0" = 6T
P3 = 2T x 6'-0" = 12T
P = 39·4T
Water = 9T x 6' = 54T
P4 = 3·6T x 6'-0" = 21·6T
P5 = 2·4T x 6'-0" = 14·4T
16'-9"
10·5
W = 3T
Reactions R1 to R6 to ¼ Scale of Stress Diagram

Fig.13.

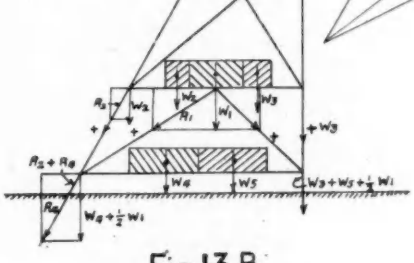
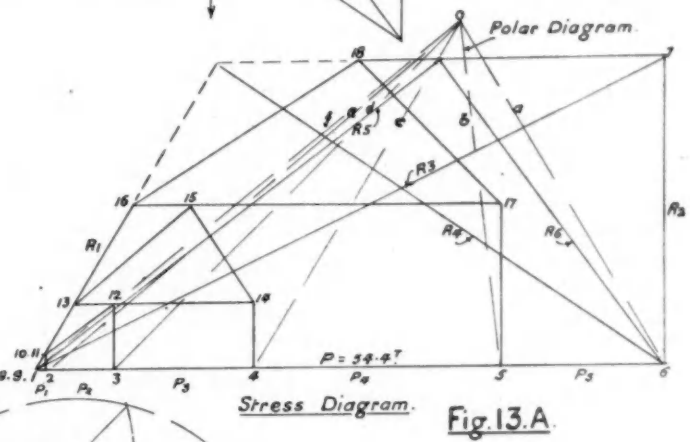


Fig.13.B.



Stress Diagram.

Fig.13.A.

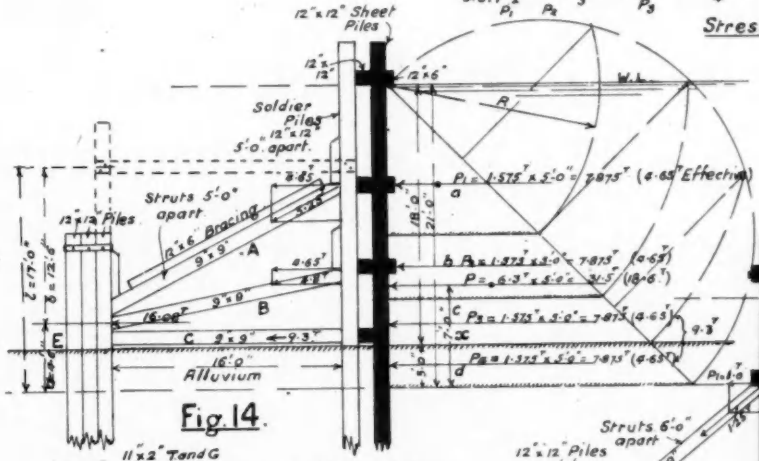


Fig.14.

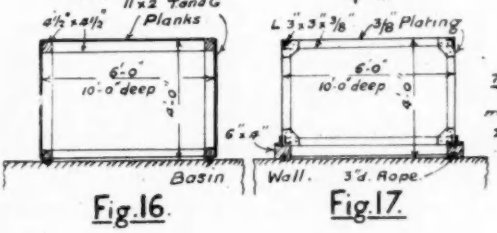


Fig.16.

Fig.17.

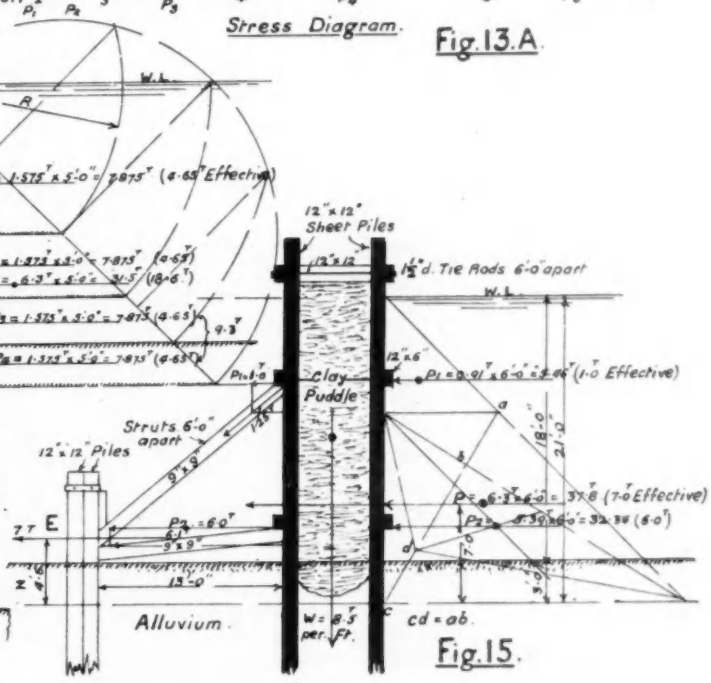


Fig.15.

Temporary Dams—continued

and $53.2 \times 2,240 \times 12 = 1,430,016$-in. lbs., the stress $= \frac{M.y.}{I.} = \frac{1430016 \times 6}{1728} = 4,965.3$ lbs. per sq. inch.

This is about half the breaking strength of the timber, and gives too low a factor of safety, so that no advantage is gained. As the maximum tensile strength of sound pitch pine is 12,000 lbs. per sq. inch, there will be a factor of safety of about 5 against the piles breaking.

The resultant pressure on the strut at C, which carries the greatest load is 9.3 tons = 20,832 lbs., it is 9-in. by 9-in. and 16-ft. long, and the following formulae have been used to calculate its strength, viz. (1):— $P = \frac{8200}{1 + 0.00333\ K^2}$. (2) $P = 4000 - 0.8\ K^2$, (3) $P = 4000 - 1.0\ K^2$ (for partially seasoned timber), (4) $P = 3500 - \frac{3500\ L}{100.\ D}$, and (5) $P = \frac{6000}{1 + 0.004\ K^2}$ all of which are for yellow pine struts. P = the ultimate crippling strength in lbs. per sq. inch and $K = \frac{L}{D}$. The following results are obtained by the formulae, viz.: for (1) 3267 lbs., (2) 3636, (3) 3545, (4) 2753, and (5) 1785 lbs. per sq. inch, crippling stress. As the area of the strut is 81 sq. inches, the load of 20,832 lbs. amounts to a pressure of 257 lbs. per sq. inch, and by formula (4) there will be a factor of safety of 10.7, and by (5) one of 8.2 against crippling.

The strength of timber both in tension and compression varies so much, according as to whether it is wet or dry, seasoned or unseasoned, and free from shakes, cracks, or knots, that high factors of safety should be provided for, the usual being 10 when in tension, 5 in compression and 4 in shear, for permanent work, but for temporary works lower values may be taken.

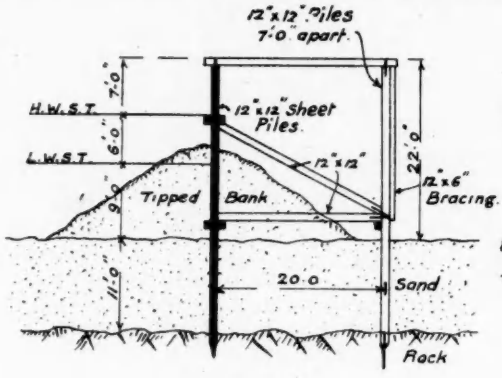


Fig.18.

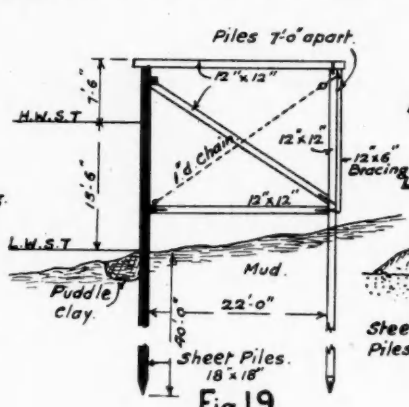


Fig.19.

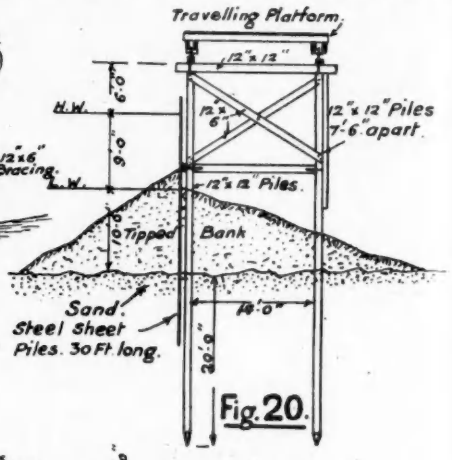


Fig.20.

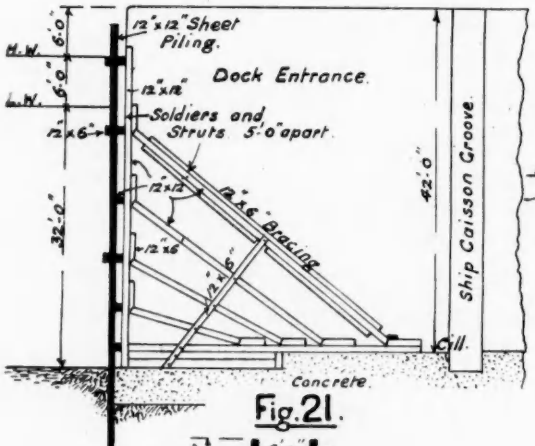


Fig.21.

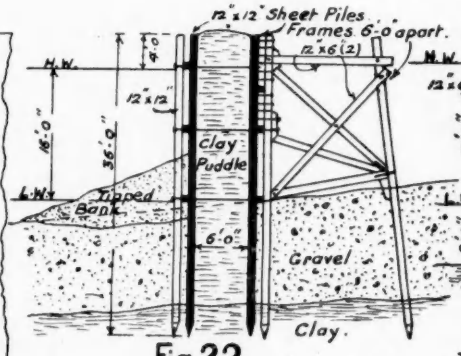


Fig.22.

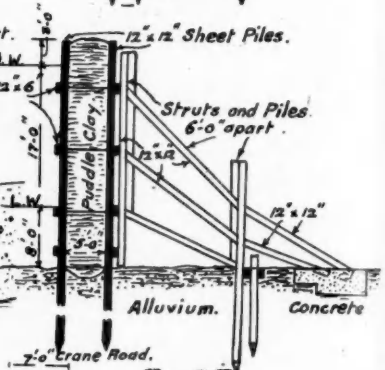


Fig.23.

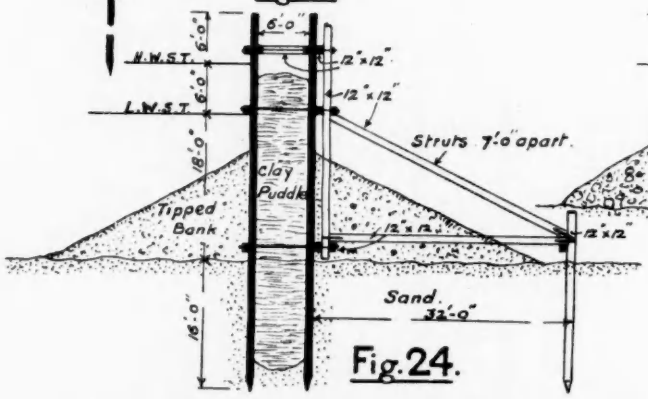


Fig.24.

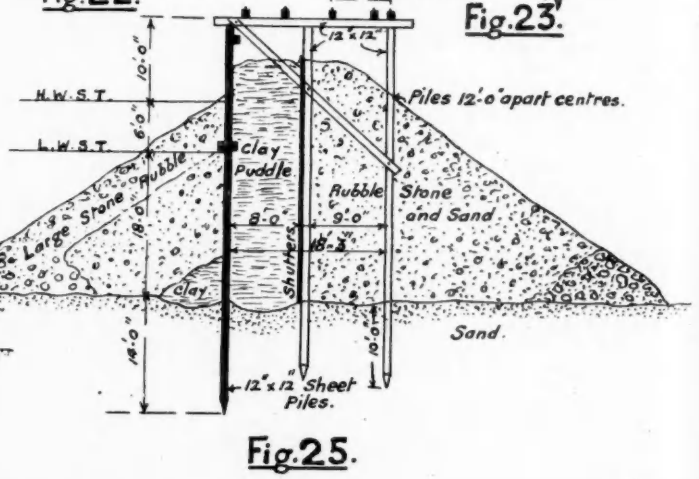


Fig.25.

Temporary Dams—continued

The safe compression stress on columns and struts should not exceed 1000 lbs. per sq. in., usually 800 or 900 lbs. is taken, and 1200 lbs. in tension.

The ultimate strengths of some pine timbers, in lbs. per sq. inch, based on experiments made on large specimens in tension (T), compression (C), and shear (S), are as follows, viz.:—Georgia pine or pitch pine (*Pinus rigida*), T = 10,000 to 12,000, C – 8,000 to 8,500, S = 5,000 to 5,050. Southern long leaf yellow pine, also known as pitch pine (*Pinus palustris or P. Australis*), T = 10,000 to 12000, C = 8,000 to 9,800, S = 5,000 to 5,700. Northern pine, Oregon, Washington and Douglas fir (*Pseudotsuga Douglasii*), T = 12,000, C = 6,000, S = 4,300 to 5,000. Canadian red pine (*Pinus resinosa*), T = 10,000, C = 6,000, and S = 4,000 lbs. per sq. inch.

Puddle Dams

The puddle dam shown in Fig. 15, is a type of dam much used, when puddle clay, that is, clay which is free from stones, gravel and sand, and has been watered and kneaded in a pit, is readily obtainable.

It consists of two parallel rows of 12-in. by 12-in. timber sheet piling 5-ft. apart, but may be so much as 8 or 10-ft., according to the depth of water; the rows of piles have walings at intervals in the height, with struts at the top, and tie bolts between the walings, the space between being filled with puddle clay. The back of the dam is supported by inclined struts butting against thrust piles spaced 6-ft. apart longitudinally.

The dam shown in Fig. 15 is subject to the same head of water and pressures as that in Fig. 14, or 6.3 tons per lin. ft.

Each pile will sustain a load of 2.57 tons safely, and two piles a load of 5.14 tons, so that 6.3 – 5.14 = 1.16 tons per lin. ft. effective pressure on the dam, and 1.16 × 6-ft. = 6.96, say 7 tons horizontal pressure on the struts and the two back piles at E, or 3.5 tons per pile. $M = P.Z. = 3.5 \times 4.5' \times 12 = 189$ inch tons, and the stress $= \frac{M.y.}{I} = \frac{189 \times 6''}{1728} = 0.65$ tons or 1,456 lbs. per sq. inch, so that two piles will be sufficient, and 9-in. by 9-in. struts will suffice as the loads on them are not heavy.

Box Dams

Box or limpet dams for carrying out minor works on basin walls are usually constructed or 4½ to 6-in. square timber framing, with 1½-in. to 2-in. thick tongued and grooved or V-jointed planks, spiked to the framing on three sides and the bottom, the latter being also fixed with iron straps. The bottom or floor is weighted with cast iron kentledge, and the dam is lowered by a crane against the wall until the top of the dam is about 2-ft. above the water level.

Where the timber of the framework bears against the wall, the joint is made watertight by hemp rope 2 or 3-in. in diameter, fixed in a groove in the bearing timbers of the frame; round rubber is sometimes used, but rope makes a better joint.

The timber box dam shown in Fig. 16, is 6-ft. by 4-ft. by 10-ft. deep, outside dimensions, and is formed of 4½-in. square timber framing, and planking 2-in. thick, it contains about 33 cub. ft. of timber, which at 35 lbs. weight per cub. ft. = 1,155 lbs. and including the ironwork in straps, bolts, and spikes the weight will be about 1,230 lbs. = 0.54 ton; 25 cub. ft. will be in water, allowing a freeboard of 2-ft., therefore the weight of the dam in water is = 25 × (64 – 35) = 725 lbs. + 8 cub. ft. × 35 lbs. = 280 lbs. + 75 lbs. for steelwork = 1,080 lbs., or 0.45 tons.

Therefore 1,230 = 1,080 = 150 lbs. of cast iron ballast will be required to just sink it. As the interior water is being pumped out, the upward water pressure increases, and when the pumping has been completed the water displaced will be 8 × 6 × 4 = 192 cub. ft. = 5.48 tons, and as the dam weighs 0.45 ton, then about 5 tons of ballast will be required on the floor to keep it sunk, neglecting wall friction.

Cast iron ballast in rectangular blocks weighs when laid 400 lbs. per cub. ft. of space occupied or 3.6 cub. ft. per ton.

If the dam is constructed as shown in Fig. 17, of 3-in. by 3-in. by ⅜-in. angle steel framing and ⅜-in plates, with 6-in. by 4 in. timbers on the face next the wall, its weight will be about 1.62 tons, and as the uplift is 5.48 tons, then 3.86 tons of ballast will be required, neglecting the small amount of water displaced by the materials.

Figs. 18 to 25, show various types of temporary dams that have been constructed, and are self-explanatory.

Fig. 23 shows another method of taking the thrust from the struts at the back of the dam, by employing a block of concrete, but this is liable to slide.

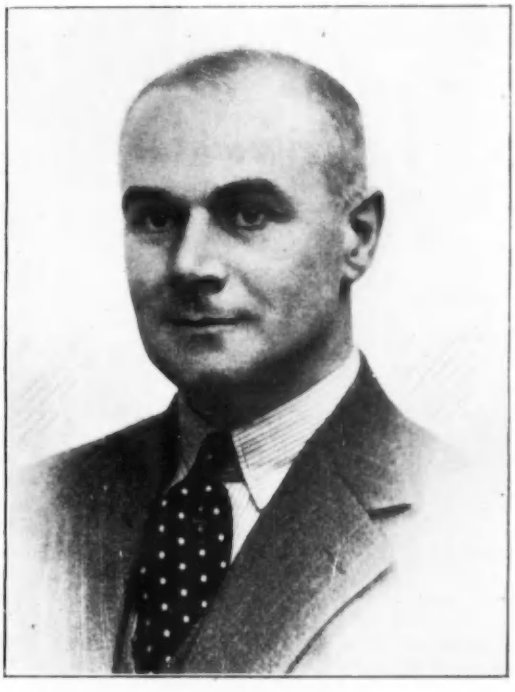
Dams have been constructed without sheet piling, by driving piles 2-ft. apart longitudinally in two rows, and 17-ft. apart in cross section, with 12-in. by 8-in. walings on the outside at the top and bottom, tied together with tie rods. On the insides of the piles 12-in. by 3-in. horizontal planks were laid to form a shuttering, the space between, filled with clay puddle up to 20-ft. deep, for 18-ft. head of water, the dam being strutted to a soldier pile at the back at intervals of 6-ft.

Notable Port Personalities

XXIX—Mr. N. M. Hood

Mr. Norman Mackenzie Hood, M.Inst.T., succeeded the late Mr. Albert Blacklock as the General Manager of the Tyne Improvement Commission on the 1st July, 1940.

He commenced his career with the Great Western Railway Company at Bristol in 1907 and continued in their employ, except for service with the Royal Engineers in the 1914-18 war, until 1920.



Mr. N. M. HOOD.

In 1920 he took up an appointment with the Port of Bristol Authority and from there proceeded to Preston in 1923. He was Assistant Traffic Manager at the Port of Preston from 1923 to 1935, when he joined the staff of the Tyne Commission as Senior Assistant to the General Manager, occupying that position until his present appointment.

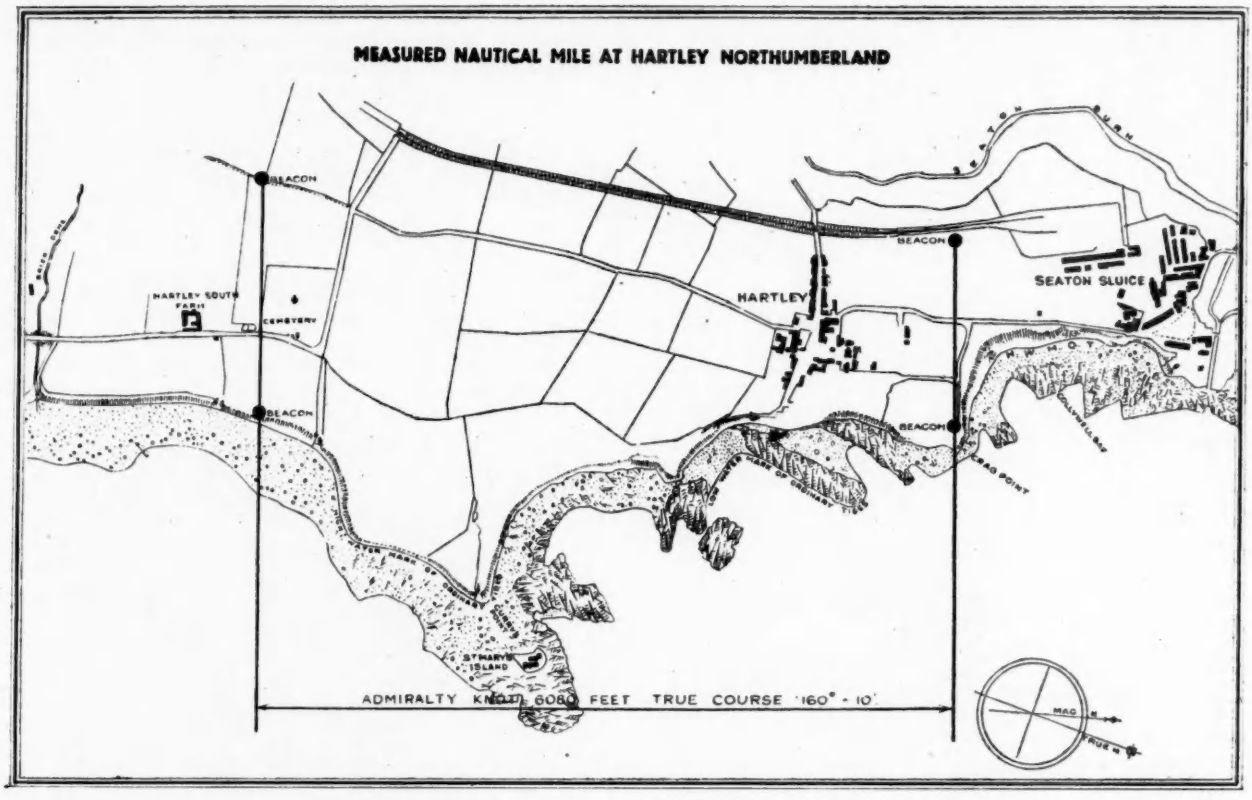
Mr. Hood has had a wide experience of port administration and of labour questions in dock and harbour work.

At the present time Mr. Hood is Chairman of the National Dock Labour Corporation—Tyne and Wear District Board, and chairman of the North-east Coast Council of Port Labour Employers. He is also a member of the Institute of Transport.

*Historical Note on the Hartley Measured Mile Posts, North of Tynemouth**

Origin and Maintenance

The first paper read before the North-East Coast Institution of Engineers and Shipbuilders was contributed by the late Sir William White (then Mr. W. H. White) on the 22nd December, 1884, and its subject was " Speed Trials of Steamships." . In the course of the paper he recommended that the site of the Mile Posts be changed to a position further North.



The Mile Posts then in existence had been erected through the endeavours of Mr. Wigham Richardson, and they had taken the place of previously existing posts; but there is no Institution record of who erected these earlier posts.

As the result of Sir William White's paper, the Council appointed a sub-committee on 23rd January, 1885, to consider and report upon the subject of improving the position of the then existing measured mile on the coast. This committee reported to the Council on the 28th September, 1885, that a new site had been selected and four Posts erected thereon. The Admiralty were later asked to certify the distance measured by the Posts, which they did. It was found to be 6,084-ft. The two South Posts were accordingly carried 4-ft. North, and on 13th October, 1886, it was reported to the Institution that an Admiralty certificate for the distance of 6,080-ft., i.e., a nautical mile, had been obtained.

The site of these Posts was within a few feet the same as that of the present Posts, and the direction of the Measured Mile due North. The Posts were of wood. Repainting and repairs took place in 1888 and 1889. The N.W. Post broke off 20-ft. from the ground in 1893, and both the S.E. and S.W. Posts were blown down early in 1894 and were too rotten to be re-erected. As a result of this experience with wooden posts, steps were taken to replace these by "iron posts."† A tender for such posts from Messrs. McKenzie & Holland, of Worcester, was approved on 5th October, 1894, and Mr. Robert Hudson, Jr., of Sunderland, received the contract for their erection on 28th February, 1895. In the following December it was reported that the Posts had been erected at a total cost of about £700.

It is not recorded that an Admiralty certificate for the distance measured by these new Posts was obtained: it was doubtless assumed that as they were erected exactly on the site of the old Posts (for which an Admiralty certificate had been obtained) the original certificate held good.

Owing to the subsidence of the cliff, the S.E. Post was moved 40-ft. inland in 1904.

A survey in 1912 showed that the Posts converged in a seaward direction, the shortest distance between the line of the Posts at one mile from the shore being 6072.9-ft. Negotiations with the Employers' Associations were opened with the view of having the siting of the Posts corrected. The Associations differed, however, as to the need for these corrections being made, particularly since the Admiralty had stated that no objection was seen to the acceptance of the Hartley Mile provisionally. Accordingly, nothing was done until after the War (1920-21). The Posts had not been painted or repaired in any way during the period 1914-18, and it was found that the N.E. Post was so corroded that it had to be renewed, the new Post being erected about 130-ft. West and slightly over 5-ft. North of the old position, which was too near the edge of the cliff for security. The N.W. Post was also moved about 5-ft. North. By these combined operations, it was hoped to correct the error in siting, but the hydrographer to the Admiralty, on surveying the Posts, again reported a slight convergence seaward. The Admiralty, however, agreed (1923) to accept the Mile for speed trials of Admiralty vessels.

A new chart of the Posts was thereupon prepared and copies of it printed and issued to the companies forming the members of the Employers' Associations who had undertaken to contribute to the maintenance of the Posts.

Inspection of the Posts is made at least annually. No heavy repairs were necessary from 1922 to 1935, when the topmast of the S.W. Post was carried away in a gale. On examination by the

*Referred to in Editorial Comment in June, 1942 issue. This historical note is reproduced by kind permission from the Report of the Institution Council, 1938-9

†Presumably "steel," but "iron" is the word used in the Council minutes.

Historical Note on the Hartley Measured Mile Posts—continued

Committee and the Institution's consultants, it was ascertained that the wood of the topmast had considerably rotted internally; an examination was made of the only other topmast, which was also of wood, and this was found to have deteriorated internally also. Accordingly, the two topmasts were replaced by steel ones.

Security of Tenure of the Posts' Sites

These replacements and also the complete repainting of the Posts were completed in 1937. The delay (1935-1937) was due to the necessity of settling questions which had arisen on the security of tenure of the sites.

A wayleave agreement with Monkseaton Urban District Council was formally completed in 1937 with respect to one site, and in the same year a lease of the three remaining sites was granted by the owners of the land.

Visibility

The possibility of improving the visibility of the Posts has been before the Institution since the very earliest days of their existence. As early as 1894 they were increased in height for this purpose. Messrs. Palmers, Messrs. Hawthorn, Leslie & Co., Ltd., and Messrs. Armstrong, Whitworth & Co., asked permission, on the 5th October, 1903, to increase the height of the S.E. and S.W. Posts by 30-ft. at their own expense in order to facilitate the conduct of trials of fast vessels in deep water. This request was granted. A solution by other means than heightening was not definitely suggested, however, until 1928. The provision of electric lights on the Posts as an obvious improvement was considered then, but dismissed on account of the very high cost of laying electric cables to the Posts. For the time being experiments were made with different colours of paint, the result being the adoption (1931) of black for the whole of the Posts (they were at one time painted black and white). Sunshine signs were also considered, but were not regarded as a practical solution of the problem. In deciding on the colour of the Posts the views of shipbuilding and engineering companies and pilots were obtained and formally considered.

In 1935, Dr. Baker, Superintendent of The National Physical Laboratory, recommended that neon lights be fitted to the rear Posts. After much consideration and investigation, it was decided to recommend to the Employers' Associations that 20-ft. lengths of neon tubing be fitted to the upper part of the four Posts. Competitive quotations for the neon lighting were obtained, and the North-Eastern Electric Supply Company were able to offer a more favourable quotation than formerly for the laying of cables to the Posts, these terms including an undertaking to grant a rebate as the continued development of land in the region of the Posts enabled the cable to be used for other purposes than for the illumination of the Posts.

The fitting of the neon lights was held up while the question of security of tenure referred to above was under consideration, since it was obviously undesirable to incur the heavy expense involved unless there was reason to believe that the Posts would remain in their present positions for a number of years. It was also considered desirable to investigate very thoroughly the condition of the structure of the Posts, and accordingly they were examined by a firm of civil engineers. This report being satisfactory, the Council of the Institution recommended and the Employers' Associations agreed, that the installation of the neon lighting of the Posts should proceed (1938).

The fitting of the neon lights was completed in September, 1938, and they have since then proved of very great service in enabling ship trials to be conducted in atmospheric conditions that, without the lights, would have necessitated the postponement of the trials. They have, moreover, made possible for the first time the conduct of ship trials in the dark, and many trials in the night have now been carried out.

The lights are still regarded as somewhat experimental and already it has been found advisable to lower the seaward lights in relation to those on the landward Posts. The Institution Committee was (1939) actively engaged in the consideration of means for improving the usefulness of the lights prior to the outbreak of war.

Finance

When, in 1885, Posts were first erected by the Institution, the shipbuilding and engineering companies of the Tyne and Wear met the cost of the work, making their payments direct to the Institution. The small fund appearing in the Institution accounts each year represents a surplus of contributions received from companies in 1896, and the income from it is applied towards the payment of the rent of the sites. In 1911 the North East Coast Shipbuilding and Engineering Employers' Associations undertook to meet the cost of upkeep of the Posts and to pay the ground rent of the land on which they were placed, at the same time asking the Institution to continue its custodianship of the Posts. This arrangement is still in operation between the Institution and the Employers' Associations.

The British Engineers' Association

Distinction for Materials-Handling Expert

The election of Mr. Cecil Bentham to the Presidency of the British Engineers' Association is of interest to dock and harbour engineers by reason of his long and intimate connection, as chairman and managing director, with Henry Simon, Limited, and his responsibility for their grain-handling installations which are a prominent feature at many British ports. A number of these installations have been described and illustrated in recent volumes

Mr. C. BENTHAM.

of this Journal, in which are also to be found in Vol. xix a Paper contributed by Mr. Bentham to the Institute of Transport in 1938 on the "Transport of the Grain Harvests of the World" and in Vols. xvii and xviii, a description of the "Equipment for Handling Phosphate Rock at Nauru and Ocean Islands" (in the Pacific).

Mr. Bentham is a Member of the Institution of Civil Engineers, of the Institution of Mechanical Engineers and of the Institute of Transport. In early life he achieved distinguished success in engineering subjects at the Sheffield Technical School, now merged in the Sheffield University.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this Journal should not be taken as an indication that they are necessarily available for export.

Legal Notes

Responsibility for Cargo Slings

In a recent action arising out of an accident during the loading of a ship at the Liverpool Docks, claim was made that the stevedores failed to take reasonable precautions for the safety of the men employed on the job.

On behalf of the plaintiff, Mr. James Colfar, a dock labourer, Mr. Rice Jones said that the claim was one against the plaintiff's employers for failing to take reasonable care for Colfar's safety by providing a proper system of work. On March 9th last bags of salt were being loaded from a barge into a ship by means of married gear, or shackled gear, when a bag which fell out of a sling struck the plaintiff and injured his back. Mr. Rice Jones urged that the number of bags placed in a sling should be regulated and that it was not too much to ask the employers to decide what was a safe load.

For the defendant firm, Mr. Clothier contended that there had not been a defective system of work and that the real cause of the accident was that the sling came over with a terrific bang and hit the coamings and that someone had let the guy rope slip. The dominant reason the topmost bags fell was the violent collision with the coamings and the accident was not due to the way the sling was loaded.

George Baker, the hatch foreman, said that there was no complaint before the accident of the number of bags being placed in the slings. The cause of the accident was the letting go of the guy rope, and the witness urged that the fact that there were 32 bags in the sling did not make it unsafe.

Dismissing the claim with costs, Mr. Justice Stable said that he was not satisfied that there was a complaint about the number of bags in the sling. He found that it was left to the experience of the men to load the slings, and that no hard and fast rule was imposed by the employers prohibiting the men going above a certain number of bags in any one sling. He was pretty certain the men were not being driven or pushed to put more bags in the sling than they thought reasonable.

Responsibility of Port Authority in Case of Crane Hire

At the recent Liverpool Assizes an action was brought by David Allen, a dock labourer, for personal injuries sustained in a crane accident in April last, against the Mersey Docks and Harbour Board and the British India Steam Navigation Co., Ltd. The latter were also joined as a third party. The following account of the proceedings is extracted from *The Journal of Commerce* on November 6th:—

Opening the case, Mr. Hemmerde said the plaintiff, who was 39 years of age, was on April 2nd engaged in wheeling into a dock shed a gun when a mobile crane was driven towards Allen, whose left hand was crushed, his thumb and index finger being fractured, and the palm of the hand damaged.

In evidence, Allen said he was employed by Messrs. Coggins and Griffiths, stevedores, and with two other men he was moving an anti-aircraft gun when a crane started to run back. His left hand was crushed, and he was off work for 10 weeks.

For the Dock Board, Mr. Lynskey said the agents in Liverpool for the British India Steam Navigation Co., the owners of a ship which was being loaded, were James Dowie and Co., who hired a crane from the Mersey Docks and Harbour Board, whose regulations provided that the hirers must take all risks in connection with the matter, and that the crane driver should be the servant of the hirers. The men sent with the cranes were under the control of the persons whose work they were doing.

The driver of the crane in question in that case was given instructions to take his crane out of the shed for the purpose of lifting a load outside. There was not sufficient room for the crane to be turned round and the driver started to back the crane. He saw the gun coming in through the shed and stopped the crane, but the gun ran on and the plaintiff's fingers were trapped.

James Leslie Daggan, crane driver, said when he was two yards from the shed entrance he saw the gun and stopped the crane, but the gang in charge of the gun seemed to have no chance to stop it. The accident happened in a second or two. James Dowie and Co. were in charge of laying out the quay, and the stevedores took over when cargo was ready to go into the ship.

For the British India Steam Navigation Co., Mr. Clothier urged that the third party proceedings would only arise if the plaintiff established the accident was due to the negligence of the crane driver and if it was decided that the crane driver was the servant of the Dock Board. He submitted the crane driver was in fact not to blame for the accident.

Giving judgment, Mr. Justice Stable said he accepted the evidence of the crane driver and he was not satisfied the crane driver was negligent. He thought the accident was attributable to the fact that that gun was being handled by a scanty team of three men who were unable to pull it up in time to prevent it coming into contact with the crane, which was stationary. The plaintiff's claim failed on its merits, and the action was dismissed with costs. There would be judgment for the British India Steam Navigation Co. in the third party proceedings with costs.

Mr. Justice Stable commented that it was a significant and rather shocking fact that the Mersey Docks and Harbour Board did not even know in that case the appropriate party to whom they would have been entitled to look for indemnity if liability had been attached to them. While that impenetrable fog brooded over the Mersey it was hardly surprising when a workman and his legal advisers had to decide who was the appropriate party to an action they should be left in a condition of doubt and confusion. It seemed rather regrettable that that state of confusion could not be cleared up by a commonsense working agreement, and it ought to be sufficient to sue a driver, and whoever was responsible instead of wasting hundreds of pounds for a judge to decide the thing and then go to the House of Lords.

Mr. Clothier said those instructing him were prepared to see the plaintiff received workmen's compensation.

Institution of Mechanical Engineers

Papers on Boiler Deterioration

The use of boilers in connection with various power installations at docks and the quayside renders the subject matter of two Papers read before the Institution of Mechanical Engineers on November 20th, of interest to dock and harbour engineers.

The Papers are, respectively, "Corrosion of Boiler Tubes," by Mr. T. Henry Turner, M.Sc., and "Caustic Embrittlement," by Messrs. E. W. Colbeck, M.A., S. H. Smith, B.Sc., and L. Powell, B.Sc.

The former points out that the reduction of the number of boiler tube failures to a minimum is now a matter of national importance. Tubes fail rapidly by local, and less rapidly by general, corrosion. The removal of scale by shot blasting before use will reduce the extent of losses due to pitting, and so will additions of .2 to .5 per cent. of copper. Metallurgical data regarding tubes, and chemical data regarding feed waters are summarised in the Paper from extensive records of the author. After discussion of the origin of corrosion at cracks in oxide, scale or paint, suggestions are made for preventing it. Recommendations are put forward for the simplification and standardisation of boiler water tests by a British Standards Committee and a suitable specification is outlined. The Paper concludes with an Appendix on present-day practice as regards the manufacture of boiler tubes in Great Britain.

Caustic Embrittlement is the name, somewhat erroneously given to the boiler plating condition found when it has failed in consequence of the action of feed water containing alkali which can decompose to caustic soda in the boiler. The Paper on the subject contains the result of experimental work on the process of embrittlement, from which it is to be inferred that embrittlement occurs more readily in poor quality steel and under conditions of non-uniform stress distribution. An appendix to the Paper contains a catalogue of the more important literature dealing with Caustic Embrittlement published between 1935 and 1941.

TENDERS INVITED.

TENDERS required for dredging and piling for two small Jetties and covered Dock, Hampshire Coast. Contract £5,000 to £6,000. Apply by letter to A. Rubens Cole, L.R.I.B.A., 24, Dean Street, Oxford Street, W.1.

Protection Problems for Dock Buildings

Proofing them against Vermin, Dry-rot, etc.

By ERIC HARDY, F.Z.S.

In the repair and rebuilding of raid-damaged dockland areas, much can be done to lessen the problems of vermin, dry rot, fire and other troubles, if attention is paid to proofing the new buildings as far as is possible against these troubles. The vermin problem is a serious one that will not lessen much while dockland buildings have to hold abnormally large stocks of goods in transit or store. Even when rats are exterminated by fumigation, mice often swarm in their place, having evaded the fumes by secreting their smaller bodies in crevices and cracks. It will be remembered that in South Australia and Victoria the large accumulation during 1916 and 1917 of wheat sold to the British Government and awaiting shipment on wharves attracted "billions" of mice, and damage to the extent of £1,000,000 was done. In one yard 10,000 mice were killed in one afternoon. In Britain, in normal times, there is an influx of rats to the East Anglian fishing ports during the herring season, and a corresponding return to inland farms when the season closes.

Wherever there are large accumulations of attractive foodstuffs, vermin will defy trapping and poisoning so long as the repopulation of their numbers from elsewhere can gain access. A great many old docklands would suffer much less damage from vermin if more concrete and less wood were used in their construction. Dockyards should be rat-proofed with stone and ferro-concrete wharves in place of any old timber quays, and special attention should be given to replacing derelict old wooden refreshment rooms. In dockside buildings rats generally inhabit walls, ceilings and roofs. To limit their movements and habitations, roadways and the pavings of sheds should all consist of setts on a concrete foundation; sheds should be built of bricks and reinforced concrete with no ledges, beams or angle-irons for rat runs. Small dock buildings should be built on brick or concrete piers clear of the ground, and old ropes, dunnage, etc., stored on platforms 18-in. from the ground. Pipes, drains and basements should have their openings rat-proofed with heavily-galvanised ½-in. wire mesh. Doors should have metal basement covers against a metal or stone base to prevent rats gnawing under or at corners. Expanded metal should be fitted around pipes, telephone wires and electric wire to prevent their use as rat runs.

It is hardly possible to avoid using some timber in buildings, and this will bring the risk of beetle damage, dry rot, and damp rot from wood-rotting fungi, and in the tropics, termites, but it should be borne in mind the best preventive treatments against these risks should be given to the wood before it is placed in position, and that many chemical salts, effective though they be, are unsuitable for wood exposed to the atmosphere as the rain eventually washes them out. After the last war our imports of American timber introduced the destructive powder post beetle which is now widespread and likely to attack newly-seasoned hardwood timber, sepecially where timber imports are numerous. Fortunately, it does not attack conifers or "softwoods," and attacks only the dry sapwood, not heartwood, but it causes 50% of the damage to hardwoods after they leave the timber yard and saw mill. It is generally introduced in the building timber, and a precaution is to heat-sterilise the timber in a kiln at 130° Fahr. before use of it is a hardwood containing much sapwood. Chromated zinc chloride is a new American method of preserving wood against termites or dry rot where a clean, odourless surface is desired.

The preservation of timber against dry rot has engaged the attention of botanists, chemists and builders for many years, but despite all the research of recent years we have yet to find something to excel the general efficiency and economy of hot creosote. Elementary matters have to be seen to as well, of course, like proper ventilation of roofing timbers to avoid damp and stagnant air, never placing timber in contact with the ground unless it is very durable timber, like larch or jarrah, but contacting it with stone or concrete, or using a protective bituminous paint, and whatever the preservative used, remembering that deep penetration is more important than the toxic value of the chemical. Some timber, like Scots pine, is much easier to treat than others, like Douglas fir. Routine tasks include the protection of weak places like joints, wall plates and ends by brushing hot creosote on at 140° fahr., and watching for the first signs of infection, like flecks of discoloration, change of odour, loss of strength and weight, quicker absorption of water, wavy roof tiles from infected roof rafter ends resting in wall heads, soft wood surfaces offering no resistance to a chisel or knife tip, uneven floor boards, two sections of nailed or screwed wood coming apart, or a "deal" tone when struck with a hammer or mallet. When the toad stool-like fruiting heads appear on the cracked wood it is too late to do anything but remove the wood and burn it, and to sterilise all local stone, brick and metal work with a blow lamp against spores that will spread the damage, and the long, thread-like cords by which dry rot moulds will pass through a brick wall or along steel rods to infect sound wood elsewhere. The main growth of threads that weaken the wood by feeding on it is internal, and the toad-stool-like fruiting head is a final stage to disperse dust-like microscopic spores at the rate of several millions a minute for days.

Very useful antiseptics for use with indoor woodwork, applied hot under pressure before timbers are placed in position—and often proof against future beetle damage—include water soluble chemicals, like 2% to 4% sodium fluoride, 5% acid magnesium, silicofluoride (which must not contact metal or plaster) or 2% zinc chloride; 2% zinc chloride is also safe, but copper sulphate solutions, though effective, are corrosive to metal. Pentachlorophenol, 0-phenylphenol, 2-chlorophenylphenol and tetrachlorophenol are very good. Iron sulphate or green vitriol is also effective and there are dips in a solution of ethyl mercuric chloride or a mixture of sodium tetrachloro-phenoxide and sodium-2 chloro-o-phenyl-phenoxide. After erection, these timbers can be painted over with good results, but painting before preservation will only increase the dry rot risks to badly-seasoned wood in badly-ventilated buildings. The American Phenol resin methods mentioned above have the convenience of being non-pressure methods.

Water soluble salts are not suitable for exposed woodwork which is best boiled in creosote before erection, or treated with coal tar oils. If wood can be kept for an hour or two in a tank of hot creosote at 180 to 200° Fahr. and then left overnight as the tank cools down, a very high degree of penetration is obtained. The creosote should have a content of at least 40% naphthalene fractions.

Preservation is also given by the following chemicals: 2% Wolman salts (triolites), tar-oil distillates, chlorinyl arsenious oxide, phenyl arsenious oxide, mercuric oxide, cuprous cyanide, cuprous chloride and various arsenical solutions. Proper seasoning of the timber is, of course, essential, but the use of modern kiln-dryers should avoid enormous supplies of badly-seasoned wood which affected building after the last war. Most of the woods famed for their durability, like oak, have this power only in their heartwood, and if any sapwood is included, this will have to be preserved or it will lessen the life of the timber.

The protection of warehouses against insect pests of the goods stored there is a difficult matter. For instance, the Mediterranean flour moth, and the various cocoa and fig moths which cause serious damage to stores of flour, cereals, chocolates, dried fruits, biscuits, walnuts, stored chicory, currants, raisins, coffee, cayenne pepper, etc., may be reduced considerably if certain measures are adopted, including greater cleanliness and a certain amount of temperature and humidity control. Warm, humid, badly-ventilated and poorly-lighted warehouses, mills, etc., attract these small flour, grain and fruit moths and if windows, doors and rooms are screened with fine muslin screens, especially during the summer season when the small adult moths are on the wing, it will do much to restrict their movements and save goods from infestation. Cleaner methods, like sweeping up all cocoa rubbish from under duckboards where cocoa bags are stacked, and whitewashing walls and lighting dark places, washing walls and machines with some insecticides and keeping fresh supplies of the goods from contacting old contaminated stores will aid considerably fumigation to repress the pests. Fly papers hung up at night will catch many of these warehouse moths, and it they are too expensive to purchase for large areas, traps can be made from coal-tar smeared on papers, vinegar and syrup, a flour paste, vinegar

Protection Problems for Dock Buildings

(concluded from page 195)

and water, boiled, 10% molasses, or plain pans of water left by lights at night during the adult flying season from June to August. wall, etc., sprays of 0.8% pyrethrum extract in a highly-refined white oil are very effective in controlling all stages of flour moths and meal moths in dried fruit warehouses if used twice weekly from mid-May to September. Aliphatic thiocyanates dissolved in refined kerosene are good contact-poison sprays for flies and moths. They can also be killed by heat sterilisation to 140-149° fahr., or low temperatures at 3 or 4° below zero C. Wall washes that have been used effectively include 1 drachm of corrosive sublimate per gallon of water, weak solutions of paraffin, soda and water solutions, soft soap and lime and ordinary lime wash, but poisonous wall washes must be handled with care and experience near food stores. Good floor washes include 1 lb. soda in 1 gallon of water and for floor cracks, hot lime paste (quick lime slated in water). For fumigation, 40 parts ethyl acetate and 60 parts carbon tetrachloride, using pure chemicals to avoid tainting grain.

About fifty different insect pests occur in dock warehouses in ports of world trade, like Liverpool and New York, many inhabiting the walls, floors and windows and infesting various goods in turn, and often moving from infested goods of one kind to adjacent consignments of entirely different stuff. But in addition to the use of atomised sprays of insecticides, wall and floor washes, etc., general methods of hygiene account for much. Empty sacks are as much a source of insect pests as full sacks, and sacks and bales of goods should not be stored against a wall if possible, but left with 2-ft. space; different consignments should have a similar space between them, and any sign of infestation discovered by periodical examination should be followed by the immediate isolation of the infested consignment for treatment, when its pests will not merely migrate to other goods. Floors should be swept and disinfected more often than is generally the case; grain and meal should not be spilled when trucking, or, if so, cleaned up immediately afterwards. Punctured grain is a sure sign of pest infestation. If the temperature can be kept about 40° fahr., there will be little pest activity, but if 60° or more, regular inspection is necessary to watch for pests. The practice of turning grain piles over to mix and cool down temperature often spreads infestation and makes insects migrate. Much success has been obtained on the Continent by mixing certain mineral dusts with the grain to protect it in store, while surrounding consignments with carbolic acid soap jelly has also protected them from migrating beetles. Where mites are a nuisance, it is generally the floor crevices that need treating, as already mentioned. Mastic cement can also be used to fill up crevices where pests might secrete themselves, for it has withstood the vibration of trucking, etc.

The Width of Transit Sheds

Views of American Association of Port Authorities

The following results of an enquiry made by a Committee of the American Association of Port Authorities into the existing width of transit sheds at American ports, and the conclusions to be drawn from expressions of opinion received will be of general interest. They are contained in a report of the Committee on Port Development and Construction presented to the 40th Annual Convention of the Association in November, 1941:—

"In regard to the particular matter of width of transit sheds, it will be recalled that this committee's investigation included the questionnaire answers submitted by the executives of most of the important ports in the United States and Canada, and also answers submitted by the many Steamship and Stevedore Companies operating on the Pacific Coast. After an analysis was made of these returned questionnaires, it was found that with few exceptions, most of the Public Port Authorities had constructed sheds of a width varying from 90 to 120-ft. The few exceptions were the public ports of Astoria and Portland, Oregon; Oakland, California; New Orleans, Lousiana; and Tacoma, Washington. It was almost the unanimous opinion of the Steamship and Stevedore Companies that the shed width should be increased to a maximum width of 200-ft. There were very few exceptions to this opinion, one company suggesting 140-ft. two others 180-ft. and another 250-ft.

"As a result of this study it was quite evident that future transit sheds should be designed allowing for a wider width ranging from 150 to 250-ft., depending on the amount of property available for construction purposes, the nature of cargo to be handled and the other general conditions prevailing in the locality where the marine terminal facility is to be built. There appears to be some very good reasons why transit sheds should be widened in the future, and they may be summed up briefly as follows:

"1. The greater use of mechanised equipment and the rapid disappearance of the hand truck, which makes the additional cost of transporting cargo in a wider transit shed a very minor item.

"2. The wider shed would obviate the storing of cargo that needs protection from the weather on open areas and portions of streets adjoining the existing narrower sheds.

"3. The increased tonnage which is handled to and from individual ships at North American Ports, as compared with many years ago. This results in a larger residue of cargo being left in the shed by the preceding ship and also additional space is needed for the assembling of cargo for the succeeding ship.

"4. Where the ports have a per square foot shed rental charge in their tariff, the port revenue would be increased and the additional cost to the steamship company should be offset by the prevention of congestion and the decreased labour charges hauling freight beyond the narrower sheds to open areas and street areas."

Traffic at Port of Beira.

The last report by the Companhia de Mocambique, consequent on the transfer of the undertaking to the State, shows that in 1941, 503 vessels, of 2,397,699 tons gross, entered the Port of Beira. This showed a decrease, compared with the previous year, of 15.74 per cent. in the number of ships and 28.32 per cent. in the gross tonnage. Cargo imports amounted to 246,364 tons (a decrease of 4.61 per cent. on 1940) and cargo exports to 676,083 tons (—10.43 per cent.). Passengers arrived and sailed totalled 3,923 (—7.32 per cent.).

Odense Harbour Report.

The Report for the financial year 1941-42 of the Harbour Board of Odense, Denmark, after explaining the great difficulties of operation due to severe frost during last winter, goes on to give the following particulars of the trade of the port. During the year 1941-42, 1,011 vessels, of 167,178 tons net, arrived in the harbour, compared with 1,251 vessels, 203,226 tons, during the previous year. The cargo handled totalled 315,000 tons, a decline of 12 per cent. compared with the previous year; the total included 279,100 tons of imports and 36,500 tons of exports. The income of the Harbour Board was 573,000 kroner, of which 19 per cent. was accounted for by shipping dues and 81 per cent. by cargo dues. In the previous year the income was 626,000 kroner, and the average before the war was 1,100,000 kroner. There was a deficit of 680,541 kroner in 1941-42, which was 166,397 kroner more than had been estimated.

A commencement has been made on the scheme for the extension of the port accommodation which is estimated to cost 2,750,000 kroner.

Helsingborg Harbour Finances.

From estimates issued by the Harbour Board of Helsingborg, Sweden, it would appear that there will be a deficit in the accounts of 629,169 kroner compared with a deficit of 928,074 kroner estimated for 1942. On the expenditure side, the cost of crane working is reduced by 3,000 kroner to 22,000 kroner, owing to an expected further falling off in employment. Maintenance of docks is estimated at 8,000 kroner, or 4,000 kroner less than this year, but maintenance of ferry berths is expected to cost 12,000 kroner, against 4,000 kroner this year, an increase due to the present bad structural condition of the berths, and the need for carrying out maintenance work at night in order not to disturb the growing ferry traffic. Port dues are expected to bring in 435,000 kroner for goods and 85,000 kroner for shipping tonnage, making a total of 520,000 kroner, against 460,000 kroner for the current year; rents are expected to bring in 195,000 kroner, and crane dues 100,000 kroner. It may be necessary to rebuild the eastern side of the train ferry berth, at an estimated cost of 100,000 kroner, and a gangway has been ordered for this berth at an estimated cost of 70,000 kroner.